【添付書類】
23 [redacted] /30

(19)日本国特許庁（ＪＰ） (12)公開特許公報（Ａ） (11)特許出願公開番号
特開平11－288428
(43)公開日 平成11年(1999)10月19日

(51)Int.Cl.*	識別記号	ＦＩ	
Ｇ０６Ｆ 17/50		Ｇ０６Ｆ 15/60	６１４Ｄ
Ｇ０６Ｔ 1/00		15/62	Ｋ

審査請求 有 請求項の数１ ＯＬ （全 23 頁）

(21)出願番号 特願平10－91372
(22)出願日 平成10年(1998)４月３日

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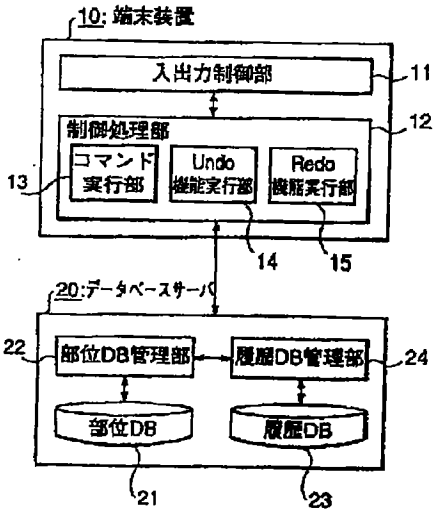
(54)【発明の名称】 チーム形式設計用ＣＡＤシステム

(57)【要約】
【課題】 チーム形式による設計時において設計者単位に実行可能なアンドゥ機能又はリドゥ機能を提供する。
【解決手段】 データベースサーバ２０は、同一チームにおいて共通に設けられた部位ＤＢ２１及び履歴ＤＢ２３と、設計者が行う操作の履歴情報を収集して履歴ＤＢ２３に記録する履歴ＤＢ管理部２４とを有する。履歴情報には、操作が行われた日時、その操作の対象となった要素、その操作の種別、その操作を行った設計者、履歴情報の有効フラグとが含まれている。操作者基準モード時にある設計者がＵｎｄｏ機能を実行すると、当該設計者が行った操作の履歴情報を検索して当該設計者が行った直前の操作のみを取り消し、同一チーム内の他の設計者による操作は取り消さない。また、ある設計者がＲｅｄｏ機能を実行すると、当該設計者が直前にＵｎｄｏ機能を実行して取り消した操作を復活させ、同一チーム内の他の設計者による操作は復活させない。



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【特許請求の範囲】

【請求項１】 複数の設計者がチーム形式で行う設計作業において各設計者が行う各操作の内容を履歴情報として共通の履歴情報記憶手段に順次記録するとともに履歴情報の前記履歴情報記憶手段への記録順に基づいて直前の操作を取り消すためのアンドゥ機能を提供するＣＡＤシステムにおいて、

設計者が操作を行う度に、その操作が行われた時間情報、その操作の対象となった設計対象に含まれる要素、その操作の種別及びその操作を行った設計者に関する情報を含む履歴情報を、有効と設定された操作の有効無効を表す情報と共に前記履歴情報記憶手段に記録する履歴情報収集手段と、

アンドゥ機能が実行されたときに対象となる操作を取り消すと共に前記履歴情報記憶手段に記録されている当該操作の履歴情報に対応した操作の有効無効を表す情報を無効に変更するアンドゥ機能制御処理手段と、

を有し、

前記アンドゥ機能制御処理手段は、設計者がアンドゥ機能を実行したときに当該設計者が行った直前の操作を取り消すことを特徴とするチーム形式設計用ＣＡＤシステム。

【請求項２】 請求項１記載のチーム形式設計用ＣＡＤシステムにおいて、

前記アンドゥ機能制御処理手段は、設計者がアンドゥ機能を実行したときに設計者によるモード選択に応じて当該設計者が行った直前の操作若しくは操作された時間に従った直前の操作のいずれかを取り消すことを特徴とするチーム形式設計用ＣＡＤシステム。

【請求項３】 請求項１記載のチーム形式設計用ＣＡＤシステムにおいて、

リドゥ機能が実行されたときに直前のアンドゥ機能の実行により取り消された操作を復活させると共に前記履歴情報記憶手段に記録されている当該操作の履歴情報に対応した操作の有効無効を表す情報を有効に変更するリドゥ機能制御処理手段を有し、設計者がリドゥ機能を実行したときに前記履歴情報記憶手段を検索することによって当該設計者が直前のアンドゥ機能の実行により取り消された操作を復活させることを特徴とするチーム形式設計用ＣＡＤシステム。

【請求項４】 請求項３記載のチーム形式設計用ＣＡＤシステムにおいて、

前記リドゥ機能制御処理手段は、設計者がリドゥ機能を実行したときに設計者によるモード選択に応じて当該設計者のアンドゥ機能の実行により取り消された操作又はアンドゥ機能が実行された時間に従い直前にアンドゥ機能の実行により取り消された操作のいずれかを復活させることを特徴とするチーム形式設計用ＣＡＤシステム。

【請求項５】 請求項１記載のチーム形式設計用ＣＡＤシステムにおいて、

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前記履歴情報収集手段は、一操作に関する履歴情報を、時間軸基準、要素別及び設計者別に分類して管理することを特徴とするチーム形式設計用ＣＡＤシステム。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】本発明はチーム形式で設計を行うために用いるＣＡＤシステム、特にＣＡＤシステムが提供しているアンドゥ（Ｕｎｄｏ）機能、リドゥ（Ｒｅｄｏ）機能の改良に関する。

【０００２】

【従来の技術】従来、例えば自動車の設計のように設計対象が比較的大型で多数に及ぶ部品から構成されるものを設計する場合、作成した自動車の外観を設計単位となる複数の部位（コンポーネント）に分割し、その後は各部位を同時に並行して設計を行ういわゆるチーム形式のＣＡＤシステムが導入されている。このチーム形式で設計を行う際に用いるＣＡＤシステムにおいては、複数の設計者がデータ処理用の各端末装置において各部位の設計を同時並行して進めることができるので、全体として設計の効率化や設計期間の短縮を図ることが可能となる。また、一つの部位に複数の部品が含まれるような場合には、一つの部位の設計を複数の設計者に割り当て部位毎にチームを形成する場合もある。各設計者は、このように各自の端末装置を用いて設計作業を行うので最終的には設計内容をまとめなくてはならないが、一つの部位を設計するチーム毎に共通の部位データベースを予め用意しておき、そのチームに属する設計者にはその部位データベースにアクセスをさせることで省ディスクスペース化や他の設計者との不具合の防止等を図っている。

【０００３】また、ＣＡＤシステムでは、キーボードやマウス等を操作させることによって設計、修正、削除、移動等のＣＡＤコマンドを実行し、その操作内容を部位データベースに反映することができるが、その操作毎の履歴情報を収集する機能を有している。例えば、同じチームに属する設計者Ａ及び設計者Ｂが同一部位に対して別々の端末装置から同時並行して図３０に示したような手順で操作が行われた場合、この操作の内容は、設計者の別に関係なく部位データベースに対応して設けられた履歴データベースに履歴情報として順次記録される。この記録された履歴情報の内容例を図３１に示す。図３１では、便宜上表形式で示しているが、各履歴情報を履歴オブジェクトとして生成している。なお、図に含まれている「要素」というのは、直線、円、四角形など一つのコマンドで描画される図形のことであり、基本的には一回の操作で一つのコマンドが実行され一つの図形が描画される。一つの部位は、通常複数の要素が組み合わされることによって設計される。

【０００４】ところで、一操作で描画した要素を取り消したい場合がある。一般的なＣＡＤシステムには、直前の操作を取り消すためのＵｎｄｏ機能やＵｎｄｏ機能に

よって取り消された要素を再度復活させるためのＲｅｄｏ機能が用意されており、設計作業の効率化が図られている。

【０００５】

【発明が解決しようとする課題】しかしながら、従来においては、履歴データベースには、異なる設計者による操作の履歴情報が入り混じった状態で操作された順番に記録されるため、例えば、図３０に示したような操作がされた状態において設計者Ｂがした「要素４の作成」操作を取り消したい場合、図３１に示した履歴データベースに記録されている履歴情報に基づくと従来のＵｎｄｏ機能であれば２回実行しなければならない。すなわち、設計者Ｂは、Ｕｎｄｏ機能を実行して設計者Ａがした「要素２の削除」操作を取り消さなければ、「要素４の作成」操作を取り消すことができない。従って、「要素２の削除」操作の取消しを設計者Ａが了承しない場合には、Ｕｎｄｏ機能を用いて「要素４の作成」操作を取り消すことはできない。

【０００６】このように、従来においては、同一チームの設計者により実行され入り混じった状態で逐次記録された操作の中から自己がした直前の操作のみを取り消したいような場合でも、Ｕｎｄｏ機能を用いることによって有効な操作を共に取り消さなくてはならない。あるいはＵｎｄｏ機能を実行すれば要素を元の状態に戻せるような場合でもＵｎｄｏ機能の実行に相当する新たな設計作業が発生することになり効率的でない。

【０００７】本発明は以上のような問題を解決するためになされたものであり、その目的は、設計者単位に操作の取り消しができるアンドゥ機能又は設計者単位にアンドゥ機能により取り消した操作を復活させるリドゥ機能を提供するチーム形式設計用ＣＡＤシステムを提供することにある。

【０００８】

【課題を解決するための手段】以上のような目的を達成するために、本発明に係るチーム形式設計用ＣＡＤシステムは、複数の設計者がチーム形式で行う設計作業において各設計者が行う各操作の内容を履歴情報として共通の履歴情報記憶手段に順次記録するとともに履歴情報の前記履歴情報記憶手段への記録順に基づいて直前の操作を取り消すためのアンドゥ機能を提供するＣＡＤシステムにおいて、設計者が操作を行う度に、その操作が行われた時間情報、その操作の対象となった設計対象に含まれる要素、その操作の種別及びその操作を行った設計者に関する情報を含む履歴情報を、有効と設定された操作の有効無効を表す情報と共に前記履歴情報記憶手段に記録する履歴情報収集手段と、アンドゥ機能が実行されたときに対象となる操作を取り消すと共に前記履歴情報記憶手段に記録されている当該操作の履歴情報に対応した操作の有効無効を表す情報を無効に変更するアンドゥ機能制御処理手段とを有し、前記アンドゥ機能制御処理手段は、設計者がアンドゥ機能を実行したときに当該設計者が行った直前の操作を取り消すことを特徴とする。

【０００９】また、前記アンドゥ機能制御処理手段は、設計者がアンドゥ機能を実行したときに設計者によるモード選択に応じて当該設計者が行った直前の操作若しくは操作された時間に従った直前の操作のいずれかを取り消すことを特徴とする。

【００１０】また、リドゥ機能が実行されたときに直前のアンドゥ機能の実行により取り消された操作を復活させると共に前記履歴情報記憶手段に記録されている当該操作の履歴情報に対応した操作の有効無効を表す情報を有効に変更するリドゥ機能制御処理手段を有し、設計者がリドゥ機能を実行したときに前記履歴情報記憶手段を検索することによって当該設計者が直前のアンドゥ機能の実行により取り消された操作を復活させることを特徴とする。

【００１１】また、前記リドゥ機能制御処理手段は、設計者がリドゥ機能を実行したときに設計者によるモード選択に応じて当該設計者のアンドゥ機能の実行により取り消された操作又はアンドゥ機能が実行された時間に従い直前にアンドゥ機能の実行により取り消された操作のいずれかを復活させることを特徴とする。

【００１２】更に、前記履歴情報収集手段は、一操作に関する履歴情報を、時間軸基準、要素別及び設計者別に分類して管理することを特徴とする。

【００１３】本発明によれば、チームに属する設計者が行った操作の中からアンドゥ機能を実行した設計者が行った直前の操作を検索してその操作を取り消すことができる。

【００１４】また、同様にリドゥ機能を実行した設計者が直前のアンドゥ機能の実行により取り消された操作を復活させることができる。

【００１５】

【発明の実施の形態】以下、図面に基づいて、本発明の好適な実施の形態について説明する。

【００１６】図１は、本発明に係るＣＡＤシステムの一実施の形態を示したブロック構成図である。図１には、ネットワーク１によって接続された各設計者が使用する端末装置１０と、設計者によって共有される各種データベースを管理するデータベースサーバ２０とが示されている。

【００１７】図２は、図１に示した各端末装置１０及びデータベースサーバ２０のブロック構成図である。端末装置１０は、図示しないマウス、ディスプレイ等の各種入出力機器を制御する入出力制御部１１と、端末装置１０におけるその他の制御全般を行う制御処理部１２とを有している。制御処理部１２には、設計者に指示されたＣＡＤコマンドを実行するコマンド実行部１３と、アンドゥ機能を実行するアンドゥ機能実行部１４と、リドゥ機能を実行するリドゥ機能実行部１５とが含まれてい

る。端末装置１０は、ハード的には汎用的なＣＡＤ端末で実現可能であり、装置上で実行するアプリケーションが従来と異なる。本実施の形態では、これを線や円等の各要素の形状データを表す形状データオブジェクト、要素を表す表示画面上の表示用オブジェクト等のアプリケーションオブジェクトで実現している。

【００１８】一方、データベースサーバ２０は、設計対象の形状に関するデータを格納するデータベースを管理するが、本実施の形態では、設計対象を部位毎にチーム形式で設計するようにしているので、形状データベースとして設けられている部位データベース（ＤＢ）２１を管理している。部位ＤＢ２１は、オブジェクト指向データベースであり、部位又は部品の形状データオブジェクトを格納する。部位データベース（ＤＢ）管理部２２は、ＣＡＤコマンドの実行により生成、削除等される形状データオブジェクトに基づいて部位ＤＢ２１の更新処理等を行う。更に、部位ＤＢ管理部２２は、形状データオブジェクトの登録等に伴い履歴データベース（ＤＢ）管理部２４に履歴情報の記録を指示する。履歴ＤＢ管理部２４は、設計作業において設計者が行う操作の履歴を収集して履歴データベース（ＤＢ）２３に逐次記録する履歴情報収集手段である。また、履歴ＤＢ管理部２４は、アンドゥ機能が実行されたときに対象となる操作を取り消すと共に履歴ＤＢ２３に記録されている当該操作の履歴情報に対応した操作の有効無効を表す情報を無効と変更するアンドゥ機能制御処理手段をアンドゥ機能実行部１４と共に構成する。更に、リドゥ機能が実行されたときに直前のアンドゥ機能の実行により取り消された操作を復活させると共に履歴ＤＢ２３に記録されている当該操作の履歴情報に対応した操作の有効無効を表す情報を有効と変更するリドゥ機能制御処理手段をリドゥ機能実行部１５と共に構成する。

【００１９】図３は、本実施の形態における履歴ＤＢ２３の基本的なデータ構成例を示した図である。履歴ＤＢ２３には、設計者が操作を行う度に、その操作に関する情報が履歴情報として蓄積される。各履歴情報には、その操作が行われた時間情報、その操作の対象となった設計対象に含まれる要素、作成、修正等その操作の種別、その操作を行った設計者及びその操作の有効無効を表す情報が含まれ、図３においてはそれぞれ「日時」、「対象」、「操作」、「設計者」及び「有効フラグ」で表されている。有効フラグには、新規に記録されたときやリドゥ機能の実行によりその操作内容が復活して有効となったときには「有効」が、アンドゥ機能の実行により取り消されたときには「無効」が設定される。なお、本実施の形態では、操作内容の有効無効を「有効フラグ」というフラグ情報で表すようにしたが、他の表現方式、例えばポインタ情報で表すようにすることも可能である。

【００２０】本実施の形態において特徴的なことは、履歴情報に設計者に関する情報を持たせたことでアンドゥ機能やリドゥ機能を設計者毎に実行できるようにしたことである。例えば、図３０に示した手順で操作がされた場合に設計者Ｂが「要素４の作成」操作を取り消したい場合、設計者Ｂは、Ｕｎｄｏ機能を１回実行することによって設計者Ａがした「要素２の削除」操作を取り消すことなく、自己がした「要素４の作成」操作のみを取り消すことができる。

【００２１】ところで、本実施の形態では、従来と同様の操作された時間に沿ったいわゆる時間軸基準のＵｎｄｏ機能及びＲｅｄｏ機能と、本実施の形態の特徴である操作した設計者単位のＵｎｄｏ機能及びＲｅｄｏ機能との併存を可能としている。また、本実施の形態における各機能をオブジェクトにより実現しているので、より実施容易とするために履歴ＤＢ２３を実際には図３に示したのと異なるデータ構造で実現している。この本実施の形態において使用する履歴ＤＢ２３のデータ構造について説明する。

【００２２】本実施の形態においては、履歴情報を３つの基準に分けて管理している。一つは、時間軸を基準とした履歴情報であり、これを時間軸基準履歴管理テーブルというテーブル形式で図４に示している。一つは、操作対象とする要素を基準とした履歴情報であり、これをモデル基準履歴管理テーブルというテーブル形式で図５に示している。残り一つは、操作した設計者を基準とした履歴情報であり、これをオペレータ基準履歴管理テーブルというテーブル形式で図６に示している。図４乃至図６では、便宜上テーブル形式で表しているが、各履歴情報は、一つのオブジェクトで形成されている。設計者が操作を行う度に、各テーブルに履歴情報がそれぞれ関連付けられて記録されることになる。

【００２３】まず、時間軸基準履歴管理テーブルの履歴情報には、記録順を示す「ＳｅｑＮｏ．」、操作がされた時刻を示す「日時」、当該履歴情報に対応した操作の有効無効を表す情報としての「有効フラグ」、当該履歴情報に対応して記録されたモデル基準履歴管理テーブル上の履歴情報と関連付けるための「モデル基準履歴ポインタ」、時間軸基準履歴管理テーブル上において直後に記録された履歴情報を連携する「次履歴情報ポインタ」及び時間軸基準履歴管理テーブル上において直前に記録された履歴情報を連携する「前履歴情報ポインタ」が含まれている。「次履歴情報ポインタ」及び「前履歴情報ポインタ」は、各履歴情報が固定長であり、かつ時間軸基準履歴管理テーブルが連続領域に形成されれば、不要な情報である。また、各履歴情報を操作された時間順に連結できれば他の方法で実現してもよい。また、いったん記録された履歴情報は、原則としてＵｎｄｏ機能により取り消されたとしても消去されないので、どの操作までが有効なのかを「有効フラグ」をチェックしなくても容易に把握できるように「有効履歴ポインタ」を設けた。すなわち、有効履歴ポインタは、有効な履歴情報列

のうち末端に位置する履歴情報を指す。「有効履歴ポインタ」と「有効フラグ」のいずれか一方の情報さえあれば本システムを正常に動作させることは可能であるが、本実施の形態では処理の迅速化を図るために双方を設けている。「有効履歴ポインタ」には履歴情報の「Ｓｅｑ　Ｎｏ．」を設定すれば容易に有効な操作の末端を示すことができる。時間軸基準履歴管理テーブルには、操作が行われる度に履歴情報が蓄積されていく。この履歴情報においては、時間情報（この例では「日時」）と他のテーブルの履歴情報との関連付けをするための情報（この例では「モデル基準履歴ポインタ」）が必須なデータである。

【００２４】モデル基準履歴管理テーブルには、要素毎に図５に示したテーブルが生成される。ここの履歴情報には、作成、修正等操作の種別を示す「操作」、当該履歴情報に対応して記録された時間軸基準履歴管理テーブル上の履歴情報と関連付けるための「時間軸基準履歴ポインタ」、当該履歴情報に対応して記録されたオペレータ基準履歴管理テーブル上の履歴情報と関連付けるための「オペレータ基準履歴ポインタ」が含まれている。その他の「Ｓｅｑ　Ｎｏ．」、「有効フラグ」、「次履歴情報ポインタ」、「前履歴情報ポインタ」の履歴情報及び「有効履歴ポインタ」は、時間軸基準履歴管理テーブルと同様なので説明を省略する。モデル基準履歴管理テーブルにおいては、図３の「対象」に相当する「要素名」と他のテーブルの履歴情報との関連付けをするための情報（この例では「時間軸基準履歴ポインタ」及び「オペレータ基準履歴ポインタ１」）が必須なデータである。

【００２５】オペレータ基準履歴管理テーブルには、設計者毎に図６に示したテーブルが生成される。ここの履歴情報には、「Ｓｅｑ　Ｎｏ．」、「有効フラグ」、「モデル基準履歴ポインタ」、「次履歴情報ポインタ」及び「前履歴情報ポインタ」が含まれているが、各情報は上記各テーブルと同様なので説明を省略する。オペレータ基準履歴管理テーブルにおいては、図３の「設計者」に相当する「オペレータ名」と他のテーブルの履歴情報との関連付けをするための情報（この例では「モデル基準履歴ポインタ」）が必須なデータである。なお、時間軸基準履歴管理テーブル上の履歴情報とは、モデル基準履歴管理テーブル上の履歴情報を介して間接的に関連付けをすることができるが、「時間軸基準履歴ポインタ」を履歴情報に直接含ませてもよい。

【００２６】次に、本実施の形態における動作について説明するが、ここでは、図３０に示された手順で操作が行われることによって履歴情報が履歴ＤＢ２３に記録され、その後にＵｎｄｏ機能及びＲｅｄｏ機能が実行された場合について、図４乃至図６においてテーブル形式で示したオブジェクトの内容を模式的に示した図７以降の図を用いて説明する。また、本実施の形態においては、

設計者（オペレータ）Ａ及びＢにおいてチームが形成されているものとする。

【００２７】まず、設計者Ａ及びＢにおいて、設計が開始される前にそのチームで共有する部位ＤＢ２１及び履歴ＤＢ２３が用意される。なお、図７における時間軸基準履歴管理オブジェクト３０は、図４に示した時間軸基準履歴管理テーブルの「有効履歴ポインタ」に、各設計者のオペレータ基準履歴管理オブジェクト５０は、図６に示したオペレータ基準履歴管理テーブルの「オペレータ名」＋「有効履歴ポインタ」に、それぞれ相当する。また、追って説明するモデル基準履歴管理オブジェクト４０は、図５に示したモデル基準履歴管理テーブルの「要素名」＋「有効履歴ポインタ」に相当することになる。

【００２８】履歴情報の履歴ＤＢへの記録

まず、履歴情報が履歴ＤＢ２３に記録される動作について図８乃至図１４に模式的に示した履歴情報の遷移図及び図１５に示したフローチャートを用いて説明する。

【００２９】コマンド実行部１３が設計者Ａによる「要素１の作成」操作を理解して生成された形状データオブジェクトは、ネットワーク１を介してデータベースサーバ２０へ送信される。部位ＤＢ管理部２２は、送られてきた形状データオブジェクトを部位ＤＢ２１に登録する。更に、登録した旨を、「設計者Ａが要素１を作成した」というその操作に関する情報と共に履歴ＤＢ管理部２４に通知する。履歴ＤＢ管理部２４は、受け取った通知の内容に基づき履歴情報を履歴ＤＢ２３に記録する。すなわち、図８に示したように、前述した３種類のテーブル上の履歴情報それぞれに相当する時間軸基準履歴オブジェクト３１、モデル基準履歴オブジェクト４１及びオペレータ基準履歴オブジェクト５１を生成する（ステップ１０１，１０４，１０６）。

【００３０】まず、ステップ１０１において、時間軸基準履歴オブジェクト３１には、その「日時」に操作された時刻と「有効フラグ」に“有効”が設定され生成されるが、本実施の形態においては、日時の情報を単に「Ｓｅｑ　Ｎｏ．」に相当する記録順で示すことにする。また、「有効フラグ」が“有効”である旨を右向きの矢印３１ａで表すことにする。このようにして生成された時間軸基準履歴オブジェクト３１は、時間軸基準履歴管理オブジェクト３０により管理される。

【００３１】次に、処理対象となる要素が新規の場合、履歴ＤＢ管理部２４は、その通知に伴い当該要素に対するモデル基準履歴管理オブジェクト４０を内部に生成して動作を開始させる（ステップ１０２，１０３）。この例の場合は、要素１に対するモデル基準履歴管理オブジェクト４０を内部に生成する。ステップ１０４において、モデル基準履歴オブジェクト４１には、その「操作」に“作成”と「有効フラグ」に“有効”が設定されるが、本実施の形態においては、「有効フラグ」が“有

効”である旨を下向きの矢印41aで表すことにする。そして、要素1に対するモデル基準履歴管理オブジェクト40に連結され、更に、要素1のモデル基準履歴オブジェクトの列において有効な操作に対応するオブジェクトの末端（ここではモデル基準履歴オブジェクト41）を矢印71で指す（ステップ105）。この矢印71は、モデル基準履歴管理テーブルの有効履歴ポインタに相当する。このようにして生成されたモデル基準履歴オブジェクト41は、対応するモデル基準履歴管理オブジェクト40により管理される。

【0032】なお、Undo機能が実行されたとき、操作対象となった要素を元の状態に戻す必要がある。換言すると、形状データオブジェクトをある操作の直前の状態に戻す必要がある。また、Redo機能が実行されたとき、Undo機能の実行により元の状態に戻った要素を更に元に戻す必要がある。これを可能とするために、本実施の形態では、ある要素に対する操作がなされる度に操作対象となった要素に関するバックアップ的な状態情報をモデル基準履歴オブジェクトに関連付けて保持するようにしているが、この処理については本発明の要旨ではないため説明を省略する。

【0033】ステップ106において、オペレータ基準履歴オブジェクト51には、その「有効フラグ」に“有効”が設定されるが、本実施の形態においては、「有効フラグ」が“有効”である旨を右向きの矢印51aで表すことにする。オペレータ基準履歴オブジェクト51は、オペレータAに対するオペレータ基準履歴管理オブジェクト50に連結され、更に、オペレータAのオペレータ基準履歴オブジェクトの列において有効な操作に対応するオブジェクト列の末端（ここではオペレータ基準履歴オブジェクト51）を矢印72で指す（ステップ107）。この矢印72は、オペレータ基準履歴管理テーブルの有効履歴ポインタに相当する。そして、新たに記録された各履歴オブジェクト31，41，51は、図4乃至図6を用いて上記各テーブルについて説明したとおり時間軸基準履歴ポインタ、モデル基準履歴ポインタ及びオペレータ基準履歴ポインタで関連付けられる。この関連付けされた状況を図8では線61，62で表す。

【0034】次に、コマンド実行部13が設計者Bによる「要素3の作成」操作を理解して生成された形状データオブジェクトは、ネットワーク1を介してデータベースサーバ20へ送信される。部位DB管理部22は、送られてきたその形状データオブジェクトを部位DB21に登録する。更に、登録した旨を、「設計者Bが要素3を作成した」というその操作に関する情報と共に履歴DB管理部24に通知する。履歴DB管理部24は、受け取った通知内容に基づき履歴情報を履歴DB23に記録する。すなわち、図9に示したように、前述した3種類のテーブル上の履歴情報それぞれに相当する時間軸基準履歴オブジェクト32、モデル基準履歴オブジェクト42及びオペレータ基準履歴オブジェクト52を生成する（ステップ101，104，106）。その内容は、上記と同様の処理により設定される。

【0035】まず、ステップ101において生成された時間軸基準履歴オブジェクト32は、すでに記録されている時間軸基準履歴オブジェクト31の直後に連結される。時間軸基準履歴管理テーブルの次（前）履歴情報ポインタに相当する情報を線63で表す。なお、時間軸基準履歴オブジェクト32の内容の設定方法は上記と同じである。

【0036】次に、処理対象となる要素3は新規なので、要素3に対するモデル基準履歴管理オブジェクト40を内部に生成して動作を開始させる（ステップ102，103）。なお、モデル基準履歴オブジェクト42の内容及び有効履歴ポインタの設定方法は上記と同じである。

【0037】そして、オペレータBに対するオペレータ基準履歴オブジェクト52の生成も前述した設計者Aによる「要素1の作成」操作のときと同様にして行う（ステップ106，107）。

【0038】次に、コマンド実行部13が設計者Aによる「要素1の修正」操作を理解して生成された形状データオブジェクトは、ネットワーク1を介してデータベースサーバ20へ送信される。部位DB管理部22は、送られてきた形状データオブジェクトを部位DB21に登録する。更に、部位DB管理部22は、登録した旨を「設計者Aが要素1を修正した」というその操作に関する情報と共に履歴DB管理部24に通知する。履歴DB管理部24は、その通知内容に基づき履歴情報を履歴DB23に記録する。すなわち、図10に示したように、前述した3種類のテーブル上の履歴情報それぞれに相当する時間軸基準履歴オブジェクト33、モデル基準履歴オブジェクト43及びオペレータ基準履歴オブジェクト53を生成する（ステップ101，104，106）。各履歴オブジェクト33，43，53の各内容は、上記と同様にして設定される。このうち、時間軸基準履歴オブジェクト33には、その「日時」に操作された時刻と「有効フラグ」に“有効”が設定される（ステップ101）。そして，時間軸基準履歴管理オブジェクト30が管理する履歴オブジェクトの最後尾に連結される。モデル基準履歴オブジェクト43には、その「操作」に“修正”と「有効フラグ」に“有効”が設定される（ステップ104）。なお，要素1に対するモデル基準履歴管理オブジェクト40は、生成済みなので、モデル基準履歴オブジェクト43は、この要素1に対するモデル基準履歴管理オブジェクト40が管理する履歴オブジェクトの最後尾に連結され，これに伴い有効履歴ポインタに相当する矢印71は、このモデル基準履歴オブジェクト43に移される（ステップ105）。オペレータ基準履歴オブジェクト53には、その「有効フラグ」に“有効”が

設定される（ステップ１０６）。そして、オペレータ基準履歴オブジェクト５３は、オペレータＡに対するオペレータ基準履歴管理オブジェクト５０が管理する履歴オブジェクトの最後尾に連結され、これに伴い有効履歴ポインタに相当する矢印７２は、このモデル基準履歴オブジェクト５３に移される（ステップ１０７）。なお、その他の直前の履歴情報及び他のテーブル上の履歴情報との関連付け等の処理は、上記と同様に行われる。

【００３９】図３０に示した後述する設計者Ｂによる要素３の修正から要素２の削除までの各操作に対応する履歴情報も前述した処理を繰り返し行うことによって履歴ＤＢ２３に順次記録することができる。以降の各操作により各履歴オブジェクトが記録された状態を図１１乃至図１４に示す。

【００４０】Ｕｎｄｏ機能の実行（操作者基準モード）

前述したように、本実施の形態は、Ｕｎｄｏ機能を設計者毎に実行できるようにしたことを特徴としているが、次に、図１４に示したように履歴情報を記録した状態からＵｎｄｏ機能が実行されたときの本実施の形態における動作について図１４、図１６乃至図１９に模式的に示した履歴情報の遷移図及び図２０に示したフローチャートを用いて説明する。なお、本実施の形態では、Ｕｎｄｏ機能の実行を操作者（設計者）単位に行う操作者基準モードにおけるＵｎｄｏ機能と従来と同様に操作された時間に準じて行う時間軸基準モードとを提供するが、ここでは操作者基準モードが選択された場合の処理について説明する。

【００４１】まず、Ｕｎｄｏ機能が実行される前の履歴ＤＢ２３に記録されている履歴情報は、図１４に示されている状態であり、全ての履歴オブジェクトの有効フラグは“有効”に設定されているため、有効履歴ポインタの矢印７１，７３，７４，７５は、各要素１～４におけるモデル基準履歴オブジェクトの列の末端を指している。同様に、有効履歴ポインタの矢印７２，７６は、各オペレータ基準履歴オブジェクトの列の末端を指している。

【００４２】この状態において設計者ＡがＵｎｄｏ機能を実行したとする。この操作は、図３０に基づくこの例では「要素２の削除」操作の取り消し指示に相当する。この操作は、Ｕｎｄｏ機能実行部１４により理解され、ネットワーク１を介してデータベースサーバ２０へ送信される。送信される操作内容には、設計者名（＝Ａ）と操作名（＝Ｕｎｄｏ）が含まれる。履歴ＤＢ管理部２４は、Ｕｎｄｏ機能の実行に伴い、設計者Ａに対するオペレータ基準履歴管理オブジェクト５０を探し出し（ステップ１１１）、当該オペレータ基準履歴管理オブジェクト５０が管理するオペレータ基準履歴オブジェクトの列のうち有効フラグが“有効”である末端のオペレータ基準履歴オブジェクト５４の有効フラグを“無効”に変更する（ステップ１１２）。本実施の形態では、該当するオペレータ基準履歴オブジェクト５４を有効履歴ポインタの矢印７２で指すようにしているので該当するオペレータ基準履歴オブジェクト５４を即座に検索することができる。なお、本実施の形態においては、「有効フラグ」が“無効”である旨を左向きの矢印５４ｂで表すことにする。続いて、有効フラグを“無効”にしたオペレータ基準履歴オブジェクト５４の直前に位置し、有効フラグが“有効”な履歴情報列の末端であるオペレータ基準履歴オブジェクト５５に有効履歴ポインタの矢印７２を移動する（ステップ１１３）。次に、オペレータ基準履歴管理テーブルの無効にされた履歴情報（オペレータ基準履歴オブジェクト５４）のモデル基準履歴ポインタにより関連付けられているモデル基準履歴管理テーブルの履歴情報すなわち図１６における要素２に対するモデル基準履歴管理オブジェクト４０から連結されたモデル基準履歴オブジェクト４４の有効フラグを“無効”に変更する（ステップ１１４）。なお、本実施の形態においては、「有効フラグ」が“無効”である旨を上向きの矢印４４ｂで表すことにする。

【００４３】ここで、モデル基準履歴オブジェクトに関連付けて履歴ＤＢ２３に保持しているＵｎｄｏ対象要素への操作実行直前の状態情報を用いて部位ＤＢ管理部２２を通じて部位ＤＢ２１を以下のように場合分けして変更する（ステップ１１５）。

【００４４】「作成」操作のＵｎｄｏの場合は、形状データオブジェクトが存在しないことにする。なお、当該形状データオブジェクトは、今後のＲｅｄｏ機能実行のためにそのまま残しておく。「修正」操作のＵｎｄｏの場合は、バックアップしておいたＵｎｄｏ対象要素への操作実行直前の状態情報を用いて部位ＤＢ２１にある形状データオブジェクトを変更する。「削除」操作のＵｎｄｏの場合は、残しておいた形状データオブジェクトを現存する有効な形状データオブジェクトの集合に再登録する。この例では、「削除」操作のＵｎｄｏの場合に相当するので、「削除」操作時に保持しておいた要素２の形状データオブジェクトを有効な形状データオブジェクトの集合に再登録することで復活させる。

【００４５】続いて、履歴ＤＢ管理部２４は、有効フラグを“無効”にしたモデル基準履歴オブジェクト４４の直前に位置し、有効フラグが“有効”な履歴情報列の末端であるモデル基準履歴オブジェクト４５に有効履歴ポインタの矢印７３を移動する（ステップ１１６）。そして、モデル基準履歴管理テーブルの時間軸基準履歴ポインタにより関連付けられている時間軸基準履歴管理テーブルの履歴情報すなわち図１６における時間軸基準履歴オブジェクト３７の有効フラグを“無効”に変更する（ステップ１１７）。なお、本実施の形態においては、「有効フラグ」が“無効”である旨を左向きの矢印３７ｂで表すことにする。

【００４６】以上のように、Ｕｎｄｏ機能が実行された

ときには、履歴ＤＢ２３に対しては該当する履歴オブジェクトの有効フラグを無効にする処理及び有効履歴ポインタを移動する処理のみを行う。なお、前述した処理は、操作者基準モードにおけるＵｎｄｏ機能実行時における処理であるため、時間軸基準履歴管理オブジェクト３０が管理する有効履歴ポインタの移動は、必須な処理ではない。

【００４７】次に、設計者Ａが続けてＵｎｄｏ機能を実行したとする。この操作は、図３０に基づくこの例では「要素２の作成」操作の取り消し指示に相当する。この操作が行われると、「設計者Ａが「要素２の作成」操作を取り消した」という情報が履歴ＤＢ管理部２４に通知され、次のようなＵｎｄｏ機能実行時における処理が実行される。

【００４８】まず、設計者Ａに対するオペレータ基準履歴管理オブジェクト５０が管理するオペレータ基準履歴オブジェクトの列のうち有効フラグが“有効”である末端のオペレータ基準履歴オブジェクト５５の有効フラグを“無効”に変更する（ステップ１１１）。続いて、有効フラグを“無効”にしたオペレータ基準履歴オブジェクト５５の直前に位置し、有効フラグが“有効”な履歴情報列の末端であるオペレータ基準履歴オブジェクト５３に有効履歴ポインタの矢印７２を移動する（ステップ１１２）。

【００４９】次に、オペレータ基準履歴管理テーブルの無効にされた履歴情報（オペレータ基準履歴オブジェクト５５）のモデル基準履歴ポインタにより関連付けられているモデル基準履歴管理テーブルの履歴情報すなわち図１７における要素２に対するモデル基準履歴管理オブジェクト４０から連結されたモデル基準履歴オブジェクト４５の有効フラグを“無効”に変更する（ステップ１１４）。続いて、有効フラグが“有効”な履歴情報列の末端に有効履歴ポインタの矢印７３を移動しようとする（ステップ１１６）。ここでは、該当するモデル基準履歴オブジェクトが存在しないが、Ｒｅｄｏ機能の実行に備えて要素２に対するモデル基準履歴管理オブジェクト４０を指すようにする。もちろん、各モデル基準履歴オブジェクトは、履歴情報として記録保持するため消去しない。なお、以降の説明において有効フラグが“有効／無効”と設定されているモデル基準履歴オブジェクトを単に有効／無効なモデル基準履歴オブジェクトと適宜表現することにする。

【００５０】続いて、モデル基準履歴管理テーブルの時間軸基準履歴ポインタにより関連付けられている時間軸基準履歴管理テーブルの履歴情報すなわち図１７における時間軸基準履歴オブジェクト３５の有効フラグを“無効”に変更する（ステップ１１７）。

【００５１】本実施の形態によれば、設計者ＡによるＵｎｄｏ機能の実行により設計者Ａがした操作のみが取り消され、設計者Ａによる「要素２の作成」操作の後にした設計者Ｂの「要素４の作成」操作は、時間軸基準履歴管理オブジェクト３０に連結されている時間軸基準履歴オブジェクト３６に示されたとおり有効のままである。

【００５２】次に、設計者ＢがＵｎｄｏ機能を実行したとする。この操作は、図３０に基づくこの例では「要素４の作成」操作の取り消し指示に相当する。この操作が行われると、「設計者Ｂが「要素４の作成」操作を取り消した」という情報が履歴ＤＢ管理部２４に通知され、次のようなＵｎｄｏ機能実行時における処理が実行される。

【００５３】まず、設計者Ｂに対するオペレータ基準履歴管理オブジェクト５０が管理するオペレータ基準履歴オブジェクトの列のうち有効フラグが“有効”である末端のオペレータ基準履歴オブジェクト５６の有効フラグを“無効”に変更する（ステップ１１２）。本実施の形態では、該当するオペレータ基準履歴オブジェクト５４を有効履歴ポインタの矢印７６で指すようにしているので該当するオペレータ基準履歴オブジェクト５６を即座に検索することができる。続いて、有効フラグを“無効”にしたオペレータ基準履歴オブジェクト５６の直前に位置し、有効フラグが“有効”な履歴情報列の末端であるオペレータ基準履歴オブジェクト５７に有効履歴ポインタの矢印７６を移動する（ステップ１１３）。

【００５４】次に、オペレータ基準履歴管理テーブルの無効にされた履歴情報（オペレータ基準履歴オブジェクト５６）のモデル基準履歴ポインタにより関連付けられているモデル基準履歴管理テーブルの履歴情報すなわち図１８における要素４に対するモデル基準履歴管理オブジェクト４０から連結されたモデル基準履歴オブジェクト４６の有効フラグを“無効”に変更する（ステップ１１４）。続いて、有効フラグが“有効”な履歴情報列の末端に有効履歴ポインタの矢印７５を移動しようとする（ステップ１１６）。ここでは、該当するモデル基準履歴オブジェクトが存在しないが、Ｒｅｄｏ機能の実行に備えて要素４に対するモデル基準履歴管理オブジェクト４０を指すようにする。もちろん、各モデル基準履歴オブジェクトは、履歴情報として記録保持するため消去しない。

【００５５】続いて、モデル基準履歴管理テーブルの時間軸基準履歴ポインタにより関連付けられている時間軸基準履歴管理テーブルの履歴情報すなわち図１８における時間軸基準履歴オブジェクト３６の有効フラグを“無効”に変更する（ステップ１１７）。

【００５６】このように、設計者ＢによるＵｎｄｏ機能の実行に対しても設計者Ａの操作に基づく履歴情報に何ら影響を与えることなく設計者Ｂによる直前の操作のみを取り消すことができる。この後、設計者Ａが更にＵｎｄｏ機能を実行して「要素１の修正」操作を取り消す場合でも上記処理に従えば設計者Ｂの操作に基づく履歴情報に何ら影響を与えることなく設計者Ａによる直前の

「要素1の修正」操作のみを取り消すことができる。このときの履歴情報の状態を図19に示す。

【0057】Undo機能の実行（時間軸基準モード）

次に、時間軸基準モードが選択された場合の処理について説明する。

【0058】時間軸基準モードにおけるUndo機能では、従来と同様に設計者の別に関係なく操作された時間に従いチーム内において直前にされた操作から順に取り消すことになるが、前述した操作者基準モードでは、時間軸により制限されずに操作の取り消しが行われるため、有効な時間軸基準履歴オブジェクトが必ずしも連続して存在するとは限らない。具体的には、図19に示されているように無効な時間軸基準履歴オブジェクト33の後段に有効な時間軸基準履歴オブジェクト34が存在しうる。このような状態は、直前の操作を順次取り消すという時間軸基準モードによるUndo機能を実行させるうえでは好ましいとはいえないためこの断続状態を可能であれば解消させたい。そこで、データベースサーバ20では、時間軸基準モードへの切替時に所定の条件に合致した有効な時間軸基準履歴オブジェクトを自動的に無効にするという処理を実行する。この処理について図19，図21に模式的に示した履歴情報の遷移図及び図22に示したフローチャートを用いて説明する。

【0059】時間軸基準モードを選択するとき、有効な時間軸基準履歴オブジェクトが連続していない場合を想定してどの時間軸基準履歴オブジェクトまでを自動的に無効にするかを指定させる。各端末装置10の制御処理部12は、履歴DB管理部24から履歴情報のリストを送ってもらい、そのリストをディスプレイに表示することで設計者に指定させることができる。例えば、図21において、"日時：2"の時間軸基準履歴オブジェクト32より後段の時間軸基準履歴オブジェクトを自動的に無効にしたい場合は、時間軸基準履歴オブジェクト32を時間軸基準モードの選択時に指定させる。なお、時間軸基準履歴管理オブジェクト30が管理する有効履歴ポインタを操作者基準モードにおけるUndo機能実行時に移動させる処理をしなかったのは、操作者基準モードによるUndo機能の実行時では時間軸基準履歴オブジェクトが必ずしも連続にならないし、本実施の形態では、無効にする時間軸基準履歴オブジェクトの位置をモード切替時に指定させるようにしたから、当該処理を実行することにあまり意味がないからである。

【0060】まず、時間軸基準履歴管理オブジェクト30から始める時間軸基準履歴オブジェクト列の末端にある時間軸基準履歴オブジェクト37を取得する（ステップ121）。当該時間軸基準履歴オブジェクト37は、指定された時間軸基準履歴オブジェクト32より後段であり、かつ既に無効とされているので、何も処理をしない。そして、その直前にある時間軸基準履歴オブジェクト36を取得する（ステップ122，123，12

8）。この時間軸基準履歴オブジェクト36、更に時間軸基準履歴オブジェクト35，34も無効とされているので、同様に何も処理をしない。続いて、時間軸基準履歴オブジェクト33を取得する（ステップ121）。当該時間軸基準履歴オブジェクト33は、指定された時間軸基準履歴オブジェクト32より後段であり、かつ有効フラグが"有効"なので、この時間軸基準履歴オブジェクト33の有効フラグを"無効"に変更する（ステップ124）。そして、時間軸基準履歴オブジェクト33に関連付けられているモデル基準履歴オブジェクト43の有効フラグを"無効"に変更する（ステップ125）。そして、モデル基準履歴オブジェクト43に関連付けて履歴DB23に保持しているUndo対象要素への操作実行直前の状態情報を用いて部位DB管理部22を通じて部位DB21を変更するが（ステップ126）、この処理については、図20のステップ115と同様なので詳細な説明は省略する。続いて、履歴DB管理部24は、オペレータ基準履歴オブジェクト53の有効フラグを"無効"に変更する（ステップ127）。次に、時間軸基準履歴オブジェクト33の直前にある時間軸基準履歴オブジェクト32は、指定された履歴オブジェクトであるため、ここで処理を終了する（ステップ128，122）。この状態が図21に示されている。

【0061】本実施の形態によれば、以上のようにして時間軸基準モードへの切替時には無効な時間軸基準履歴オブジェクトが連続となるように自動調整することができる。この後にUndo機能が実行されたときには、時間軸基準履歴管理オブジェクトが管理する有効履歴ポインタ77により指された履歴オブジェクトから順次取り消せばよく、この際、上記ステップ124～126に示した処理を実行すればよい。なお、モデル基準履歴管理オブジェクト40及びオペレータ基準履歴管理オブジェクト50が管理する有効履歴ポインタは、時間軸基準モードにおけるUndo機能の実行時に用いないので有効フラグの変更に応じて必ずしも移動させる必要はない。操作者基準モードへの切替時には、各履歴オブジェクトの有効フラグを参照することによって自動的に再設定することができる。

【0062】ところで、本実施の形態においては、設計途中において時間軸基準モードへの切替処理が行われると、取り消したくない操作あるいは他の設計者による操作まで強制的に取り消されてしまうおそれがある。このため、モード切替に対しては注意を要する。しかし、これは、いずれかの設計者からモード切替指示がされた場合に自動取り消し対象の操作や確認用のメッセージを各端末装置10に出力したり、自動取り消し対象の操作が他の設計者によるものであればモード切替を抑制するなど様々な調整を行うモード切替時調整機能を設けることによって対処することは可能である。

【0063】Redo機能の実行（時間軸基準モード）

次に、時間軸基準モードにおいてＲｅｄｏ機能が実行された場合の処理について説明する。

【００６４】時間軸基準モードにおけるＲｅｄｏ機能では、従来と同様に設計者の別に関係なくチーム内おいて直前に実行されたＵｎｄｏ機能を復活させることになる。すなわち、図２１の状態においてＲｅｄｏ機能が実行されると図２３に示したような状態になるが、このときの動作について図２４に示したフローチャートを用いて説明する。

【００６５】いずれかの設計者がＲｅｄｏ機能を実行したとする。図２１によると、設計者Ａによる「要素１の修正」操作の復活指示に相当する。この操作は、Ｒｅｄｏ機能実行部１５により理解され、ネットワーク１を介してデータベースサーバ２０へ送信される。送信される操作内容には、設計者名（＝Ａ）と操作名（＝Ｒｅｄｏ）が含まれる。履歴ＤＢ管理部２４は、Ｒｅｄｏ機能の実行に伴い、まず、時間軸基準履歴管理オブジェクト３０に連結されている時間軸基準履歴オブジェクトのうち無効とされているものの先頭に位置する時間軸基準履歴オブジェクト３３を取得する（ステップ１３１）。なお、この時間軸基準履歴オブジェクト３３は、矢印７７で示された有効履歴ポインタの位置からも容易に得ることができる。そして、その時間軸基準履歴管理オブジェクト３０の有効フラグを“有効”に変更する（ステップ１３２）。続いて、有効履歴ポインタを有効にした時間軸基準履歴オブジェクト３３を指すように移動させる（ステップ１３３）。そして、時間軸基準履歴オブジェクト３３に関連付けられているモデル基準履歴オブジェクト４３の有効フラグを“有効”に変更する（ステップ１３４）。

【００６６】ここで、モデル基準履歴オブジェクトに関連付けて履歴ＤＢ２３に保持している状態情報を用いて部位ＤＢ管理部２２を通じて部位ＤＢ２１を以下のように場合分けして変更する（ステップ１３５）。

【００６７】「作成」操作のＲｅｄｏの場合は、残しておいた形状データオブジェクトを現存する有効な形状データオブジェクトの集合に再登録する。「修正」操作のＲｅｄｏの場合は、バックアップしておいたＲｅｄｏ対象要素への操作実行直後の状態情報を用いて部位ＤＢ２１にある形状データオブジェクトを変更する。「削除」操作のＲｅｄｏの場合は、形状データオブジェクトが存在しないことにする。なお、当該形状データオブジェクトは、再度のＵｎｄｏ機能実行のためにそのまま残しておく。この例では、「修正」操作のＲｅｄｏの場合に相当するので、バックアップしておいた状態情報を用いて形状データオブジェクトを変更することになる。

【００６８】続いて、履歴ＤＢ管理部２４は、オペレータ基準履歴オブジェクト５３の有効フラグを“有効”に変更する（ステップ１３６）。なお、本実施の形態においては、図２３に示したようにモデル基準履歴管理オブジェクト４０が管理する有効履歴ポインタの矢印７１をモデル基準履歴オブジェクト４３に移動させている。更に、Ｒｅｄｏ機能が実行されたときの状態を図２５に示す。

【００６９】本実施の形態によれば、このようにして従来と同様のＲｅｄｏ機能を提供することができる。

【００７０】Ｒｅｄｏ機能の実行（操作者基準モード）

次に、操作者基準モードにおいてＲｅｄｏ機能が実行された場合の処理について説明する。なお、モデル基準履歴管理オブジェクト４０及びオペレータ基準履歴管理オブジェクト５０がそれぞれ管理する有効履歴ポインタは、時間軸基準モード時においてもデータ矛盾を起こさないように常時移動されている。図２６には、図２５において操作者基準モードが選択されモードが切り替えられたときの状態が示されている。この図２６の状態において設計者ＡによりＲｅｄｏ機能が実行されると図２７に示したような状態になるが、このときの動作について図２８に示したフローチャートを用いて説明する。

【００７１】図２６に示した状態において、設計者ＡがＲｅｄｏ機能を実行したときの操作は、図３０に基づくこの例では「要素２の作成」操作の復活指示に相当するが、この操作は、Ｒｅｄｏ機能実行部１５により理解され、ネットワーク１を介してデータベースサーバ２０へ送信される。送信される操作内容には、設計者名（＝Ａ）と操作名（＝Ｒｅｄｏ）が含まれる。履歴ＤＢ管理部２４は、Ｒｅｄｏ機能の実行に伴い、まず、設計者Ａに対するオペレータ基準履歴管理オブジェクト５０が管理するオペレータ基準履歴オブジェクトの列のうち無効とされているものの先頭に位置するオペレータ基準履歴オブジェクト５５を取得する（ステップ１４１）。なお、このオペレータ基準履歴オブジェクト５５は、矢印７２で示された有効履歴ポインタの位置からも容易に得ることができる。そして、そのオペレータ基準履歴オブジェクト５５の有効フラグを“有効”に変更する（ステップ１４２）。続いて、有効履歴ポインタを有効にしたオペレータ基準履歴オブジェクト５５を指すように移動させる（ステップ１４３）。そして、オペレータ基準履歴オブジェクト５５に関連付けられているモデル基準履歴オブジェクト４５の有効フラグを“有効”に変更するとともに要素２に対するモデル基準履歴管理オブジェクト４０の有効履歴ポインタをモデル基準履歴オブジェクト４５を指すように移動させる（ステップ１４４，１４５）。ここで、要素２に関する形状データオブジェクトを有効に復活させるわけであるが（ステップ１４６）、この処理については図２４のステップ１３５と同じなので説明を省略する。更に、履歴ＤＢ管理部２４は、モデル基準履歴オブジェクト４５を介してオペレータ基準履歴オブジェクト５５に関連付けられた時間軸基準履歴オブジェクト３５の有効フラグを“有効”に変更する（ステップ１４７）。

【００７２】本実施の形態によれば、このようにして設計者毎のＲｅｄｏ機能を実現することができる。

【００７３】その他

チーム形式で設計作業を行う場合、同一の要素が複数の設計者によって設計される場合が考えられる。例えば、図２９に示したように、同一の要素１が設計者Ａ及び設計者Ｂの双方によって操作対象とされたとする。図２９に示された状態において、設計者ＢがＵｎｄｏ機能を実行して「要素１の修正」操作を取り消そうとすると、本実施の形態におけるＣＡＤシステムは、設計者Ａによる「要素１の削除」操作も取り消さなければならないことを発見する。このような場合、次のような対処方法が考えられる。

【００７４】第一に、設計者Ｂに対して設計者Ａの操作の存在により実行不可能であるという通知をして実行エラーとする方法が考えられる。第二に、設計者Ａに対して設計者ＢによりＵｎｄｏ機能が実行されたために「要素１の削除」操作を取り消してもよいかという旨を通知して操作の取り消しの可否について選択させる方法が考えられる。第三に、無条件に不都合な操作を取り消すというモードを設けて設計者Ａによる「要素１の削除」操作を強制的に取り消してしまうという方法が考えられる。図２９に示した状況においては、これら例示した方法あるいはその他の方法も含めて任意の方法で対処することができる。

【００７５】ところで、本実施の形態において示した履歴ＤＢ２３を構築することによって様々な運用にも容易に適用することができる。例えば、上記説明では、手動操作によるＵｎｄｏ機能の実行で一つずつ操作を取り消すようにしたが、戻したい日時を指定してそこまでの操作を自動的に取り消すようにすることも可能である。

【００７６】また、本実施の形態では、一の設計対象を複数の部位に分割し、複数の要素で構成される各部位を更にチーム形式で設計を行う場合を例にしたため、部位毎に共通の形状データベース（部位ＤＢ２１）及び履歴ＤＢ２３を設けたが、その上位の設計対象全体において、あるいは更に細分割した下位のレベルでのチーム形式での設計においても適用可能である。あるいは、一の設計対象を複数の部位に分割しなくても形状データオブジェクト及び履歴情報にどの部位に属するデータであるかを示す部位情報を付加して管理すれば、部位毎にチームを形成する場合でも設計対象全体において共通のデータベースを持たせることができる。

【００７７】また、本実施の形態においては、設計者Ａ，Ｂの二人の場合で説明したが、三人以上であっても実施できることは言うまでもない。

【００７８】更に、本実施の形態では、オブジェクトを形成するようにしているが、オブジェクト指向技術以外の手法で本発明に係るＣＡＤシステムを構築することも可能である。

【００７９】

【発明の効果】本実施の形態によれば、ある設計者がアンドゥ機能を実行した場合に、同一チーム内の他の設計者による操作を取り消すことなく当該設計者がした直前の操作のみを取り消すことができる。

【００８０】また、ある設計者がリドゥ機能を実行した場合に、同一チーム内の他の設計者が取り消した操作を復活させることなく当該設計者が直前にアンドゥ機能を実行して取り消した操作のみを復活させることができる。

【００８１】また、設計者毎のアンドゥ機能及びリドゥ機能の実行のみならず、従来と同様の時間軸を基準にした同機能をも選択的に実行させることができる。

【図面の簡単な説明】

【図１】　本発明に係るチーム形式設計用ＣＡＤシステムの一実施の形態を示したブロック構成図である。

【図２】　図１に示した各端末装置及びデータベースサーバのブロック構成図である。

【図３】　本実施の形態における履歴データベースの基本的なデータ構成例を示した図である。

【図４】　本実施の形態における履歴データベースを構成する時間軸基準履歴管理テーブルの構成例を示した図である。

【図５】　本実施の形態における履歴データベースを構成するモデル基準履歴管理テーブルの構成例を示した図である。

【図６】　本実施の形態における履歴データベースを構成するオペレータ基準履歴管理テーブルの構成例を示した図である。

【図７】　本実施の形態において設計が開始される前の履歴データベース管理部及び履歴データベースの設定内容を模式的に示した図である。

【図８】　本実施の形態において記録された履歴情報の設定内容を模式的に示した図である。

【図９】　本実施の形態において記録された履歴情報の設定内容を模式的に示した図である。

【図１０】　本実施の形態において記録された履歴情報の設定内容を模式的に示した図である。

【図１１】　本実施の形態において記録された履歴情報の設定内容を模式的に示した図である。

【図１２】　本実施の形態において記録された履歴情報の設定内容を模式的に示した図である。

【図１３】　本実施の形態において記録された履歴情報の設定内容を模式的に示した図である。

【図１４】　本実施の形態において記録された履歴情報の設定内容を模式的に示した図である。

【図１５】　本実施の形態における履歴情報記録処理を示したフローチャートである。

【図１６】　本実施の形態において操作者基準モード時にＵｎｄｏ機能が実行されたときの履歴情報の設定内容

を模式的に示した図である。

【図１７】　本実施の形態において操作者基準モード時にＵｎｄｏ機能が実行されたときの履歴情報の設定内容を模式的に示した図である。

【図１８】　本実施の形態において操作者基準モード時にＵｎｄｏ機能が実行されたときの履歴情報の設定内容を模式的に示した図である。

【図１９】　本実施の形態において操作者基準モード時にＵｎｄｏ機能が実行されたときの履歴情報の設定内容を模式的に示した図である。

【図２０】　本実施の形態において操作者基準モード時におけるＵｎｄｏ機能実行処理を示したフローチャートである。

【図２１】　本実施の形態において時間軸基準モード時に切り替えられたときの履歴情報の設定内容を模式的に示した図である。

【図２２】　本実施の形態における時間軸基準モードへの切替時処理を示したフローチャートである。

【図２３】　本実施の形態において時間軸基準モード時にＲｅｄｏ機能が実行されたときの履歴情報の設定内容を模式的に示した図である。

【図２４】　本実施の形態において時間軸基準モード時におけるＲｅｄｏ機能実行処理を示したフローチャートである。

【図２５】　本実施の形態において時間軸基準モード時にＲｅｄｏ機能が実行されたときの履歴情報の設定内容を模式的に示した図である。

【図２６】　本実施の形態において操作者基準モード時＊

＊に切り替えられたときの履歴情報の設定内容を模式的に示した図である。

【図２７】　本実施の形態において操作者基準モード時にＲｅｄｏ機能が実行されたときの履歴情報の設定内容を模式的に示した図である。

【図２８】　本実施の形態において操作者基準モード時におけるＲｅｄｏ機能実行処理を示したフローチャートである。

【図２９】　本実施の形態において同一要素を複数の設計者が操作の対象としたときの履歴情報の設定内容を模式的に示した図である。

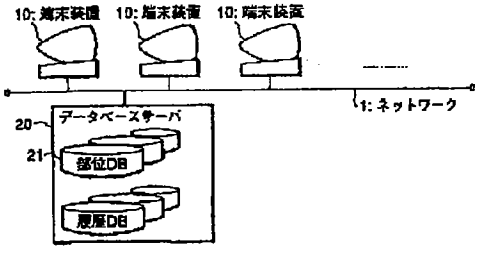
【図３０】　設計者により操作された手順の例を示した図である。

【図３１】　従来の履歴データベースのデータ構成例を示した図である。

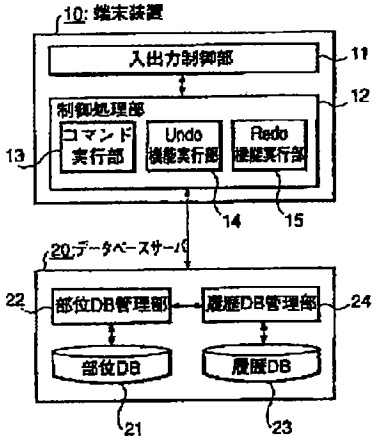
【符号の説明】

１　ネットワーク、１０　端末装置、１１　入出力制御部、１２　制御処理部、１３　コマンド実行部、１４　アンドゥ機能実行部、１５　リドゥ機能実行部、２０　データベースサーバ、２１　部位データベース（ＤＢ）、２２　部位データベース（ＤＢ）管理部、２３　履歴データベース（ＤＢ）、２４　履歴データベース（ＤＢ）管理部、３０　時間軸基準履歴管理オブジェクト、３１～３７時間軸基準履歴オブジェクト、４０　モデル基準履歴管理オブジェクト、４１～４６　モデル基準履歴オブジェクト、５０　オペレータ基準履歴管理オブジェクト、５１～５７　オペレータ基準履歴オブジェクト。

【図１】



【図２】

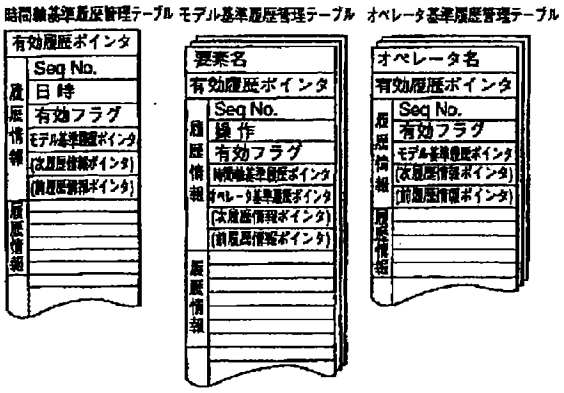


【図３】

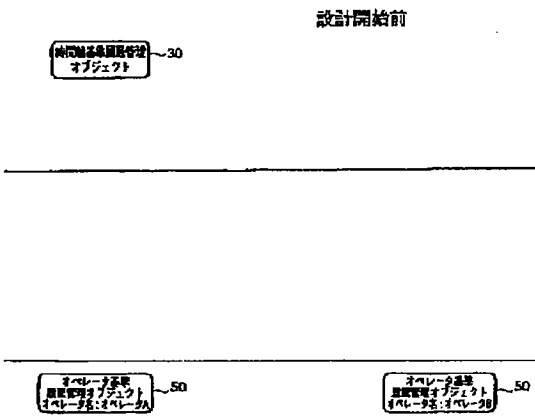
履歴データベースの基本的なデータ構成例

日時	対象	操作	設計者	有効フラグ
T1	要素1	作成	A	有効
・	・	・	・	・
・	・	・	・	・
・	・	・	・	・

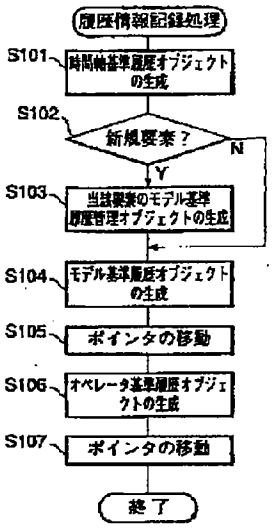
【図４】 【図５】 【図６】



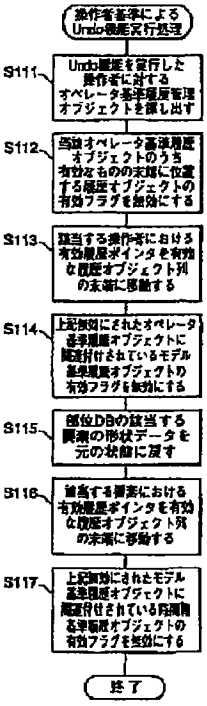
【図７】



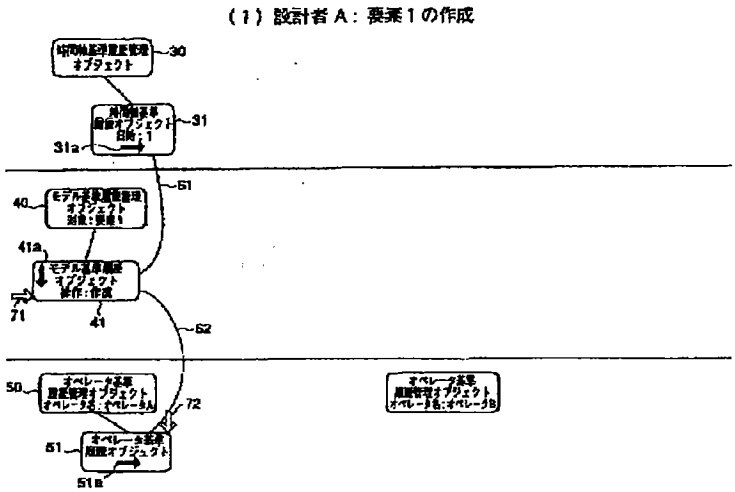
【図１５】



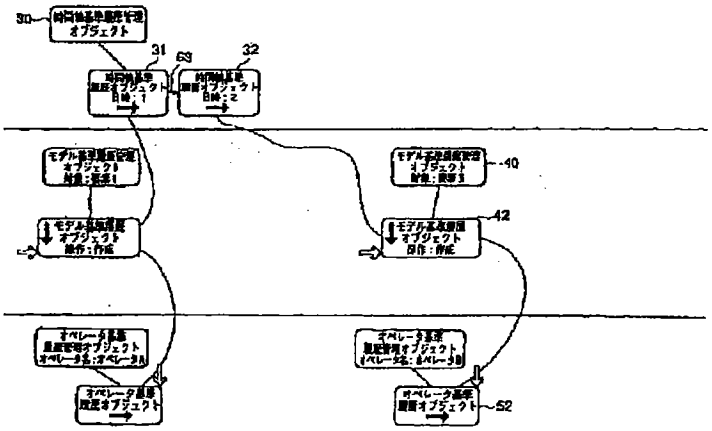
【図２０】



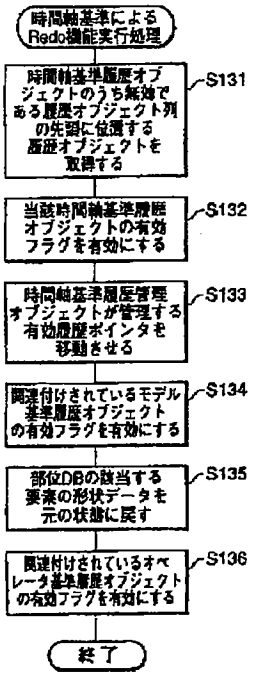
【図８】


（１）設計者Ａ：要素１の作成
30
31
31a
51
40
41a
71
41
52
50
72
51
51a

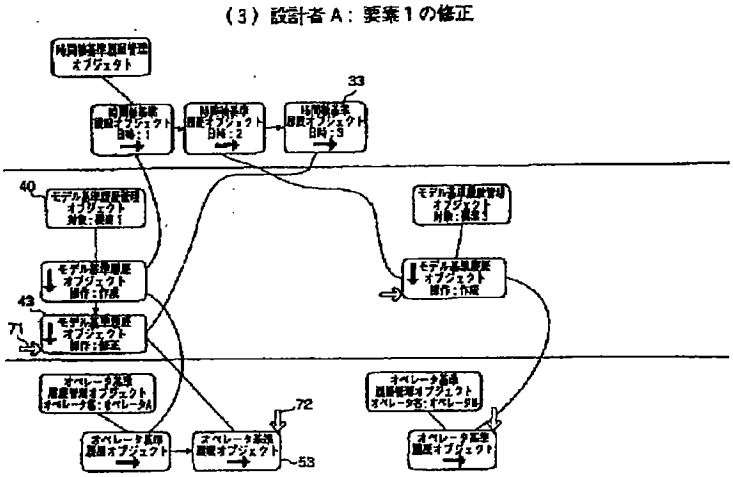
【図９】


（２）設計者Ｂ：要素３の作成
30
31
53
32
40
42
52

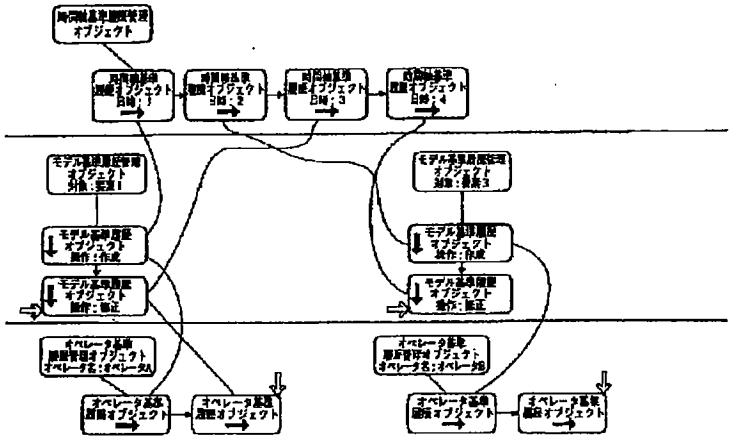
【図２４】


時間軸基準による
Redo機能実行処理
時間軸基準履歴オブジェクトのうち無効である履歴オブジェクト列の先頭に位置する履歴オブジェクトを取得する
S131
当該時間軸基準履歴オブジェクトの有効フラグを有効にする
S132
時間軸基準履歴管理オブジェクトが管理する有効履歴ポインタを移動させる
S133
関連付けされているモデル基準履歴オブジェクトの有効フラグを有効にする
S134
部位DBの該当する要素の形状データを元の状態に戻す
S135
関連付けされているオペレータ基準履歴オブジェクトの有効フラグを有効にする
S136
終了

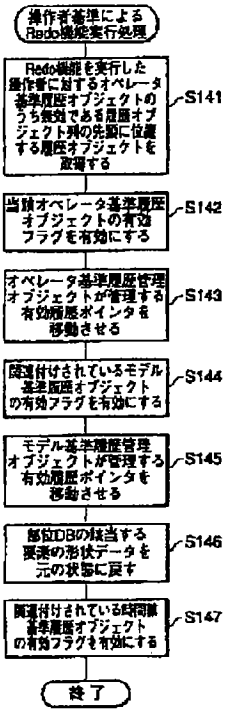
【図１０】



【図１１】



【図２８】



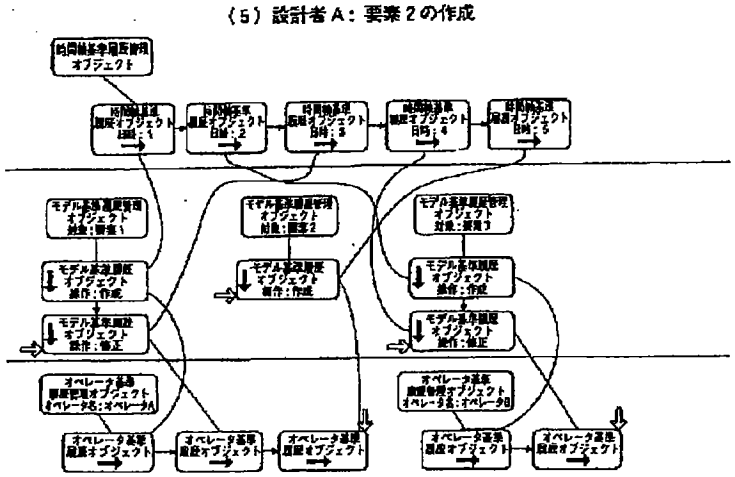
【図３０】

設計者	操作の内容
A	要素１の作成
B	要素３の作成
A	要素１の修正
B	要素３の修正
A	要素２の作成
B	要素４の作成
A	要素２の削除

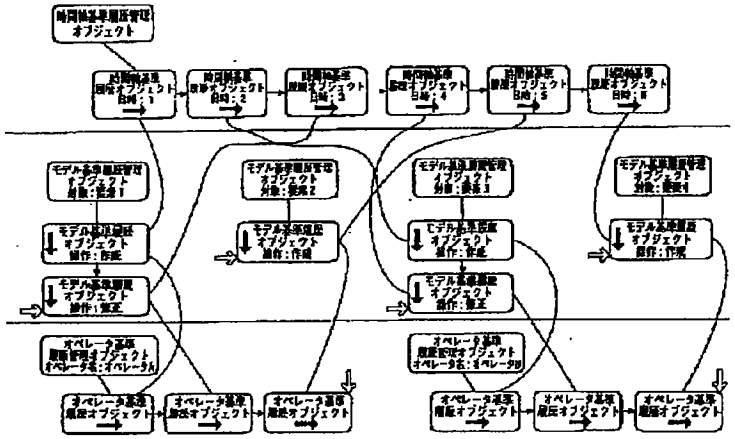
【図３１】

日時	対象	操作
T1	要素1	作成
T2	要素3	作成
T3	要素1	修正
T4	要素3	修正
T5	要素2	作成
T6	要素4	作成
T7	要素2	削除

【図12】

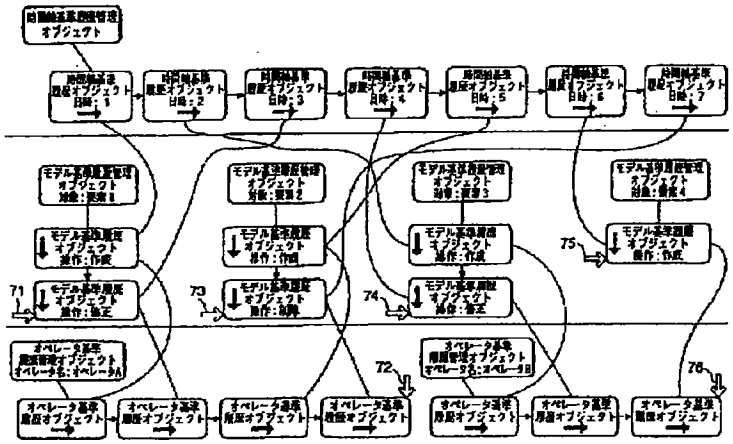


【図13】



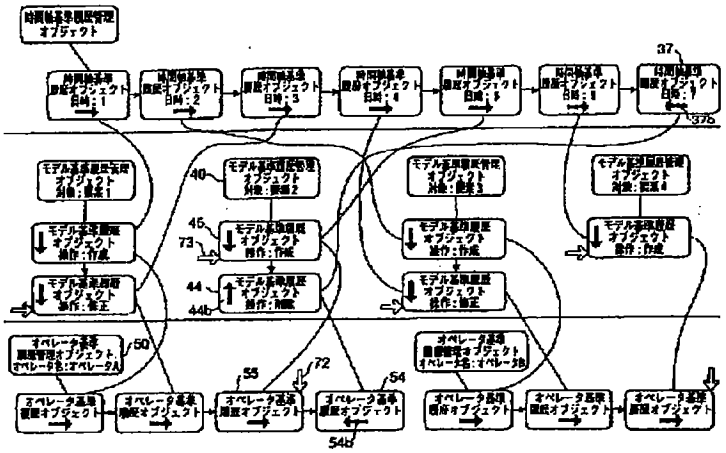
【図１４】

(7) 設計者A：要素２の削除

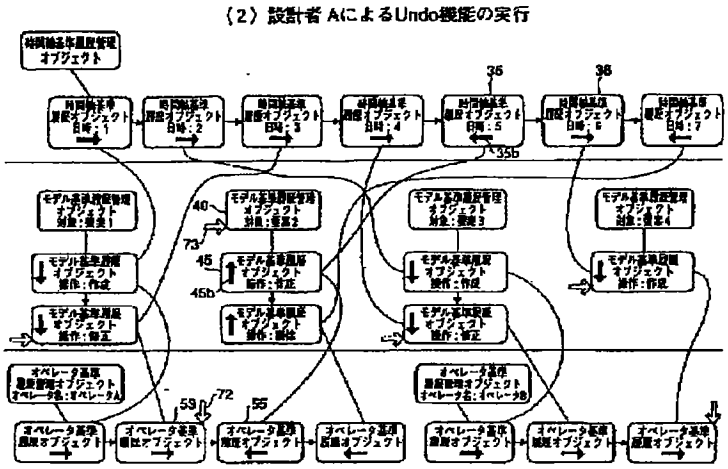


【図１６】

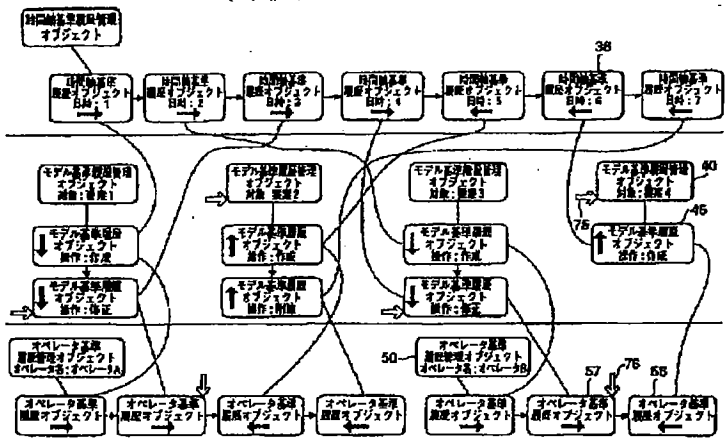
(1) 設計者AによるUndo機能の実行



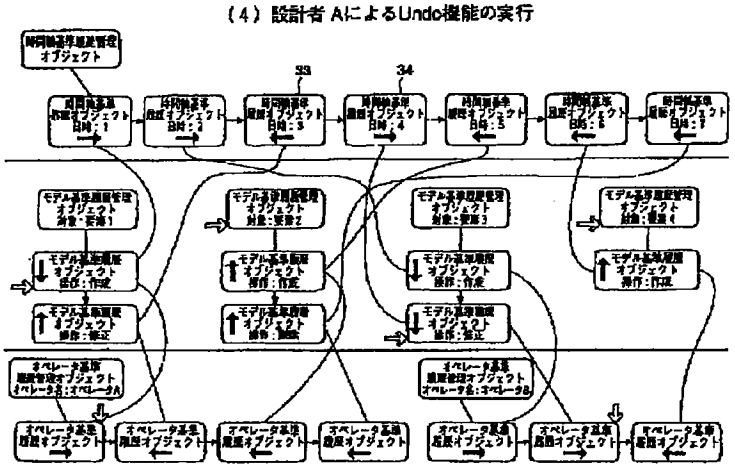
【図17】



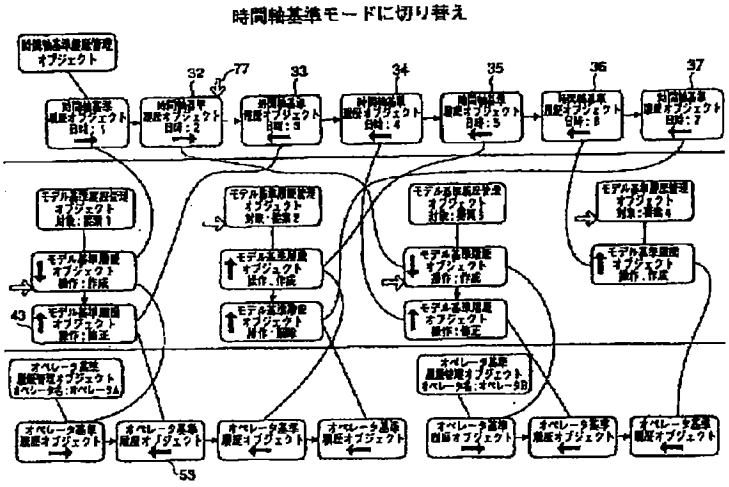
【図18】



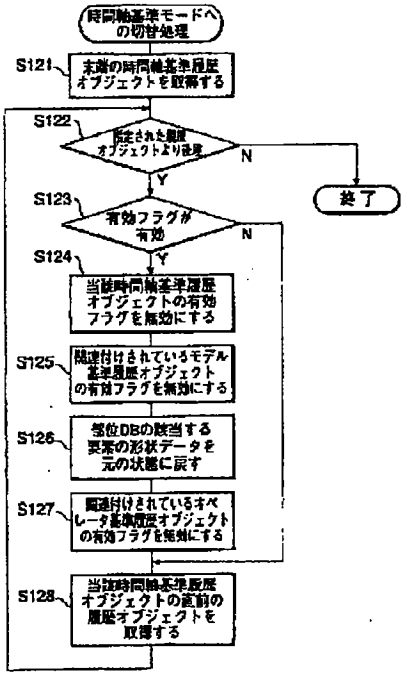
【図１９】


（４）設計者 AによるUndo機能の実行
33
34

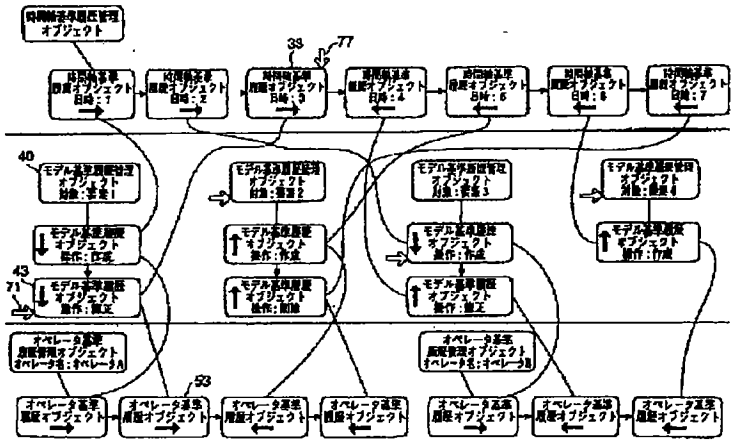
【図２１】


時間軸基準モードに切り替え
32
77
33
34
35
36
37
43
53

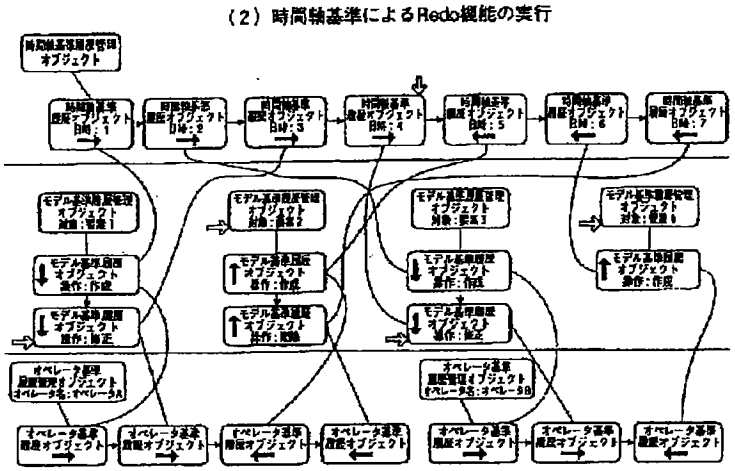
【図２２】


時間軸基準モードへの切替処理
S121
末端の時間軸基準履歴オブジェクトを取得する
S122
指定された履歴オブジェクトより後尾
N
Y
終了
S123
有効フラグが有効
N
Y
S124
当該時間軸基準履歴オブジェクトの有効フラグを無効にする
S125
関連付けされているモデル基準履歴オブジェクトの有効フラグを無効にする
S126
空位DBの該当する要素の形状データを元の状態に戻す
S127
関連付けされているオペレータ基準履歴オブジェクトの有効フラグを無効にする
S128
当該時間軸基準履歴オブジェクトの直前の履歴オブジェクトを取得する

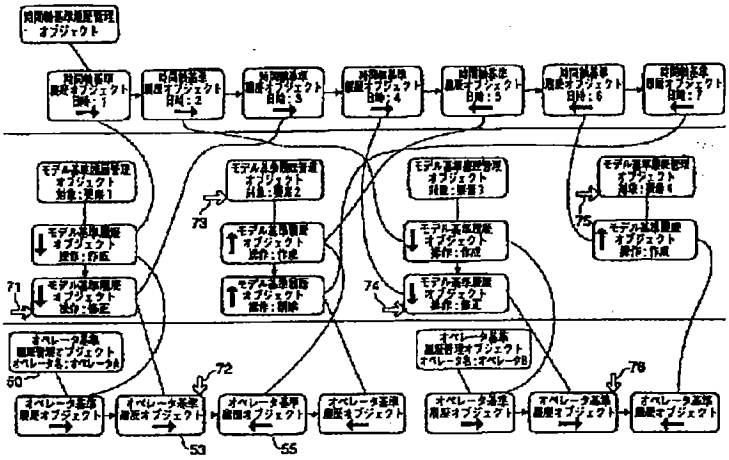
【図２３】


（１）時間軸基準によるRedo機能の実行
33
77
40
43
71
53

【図25】

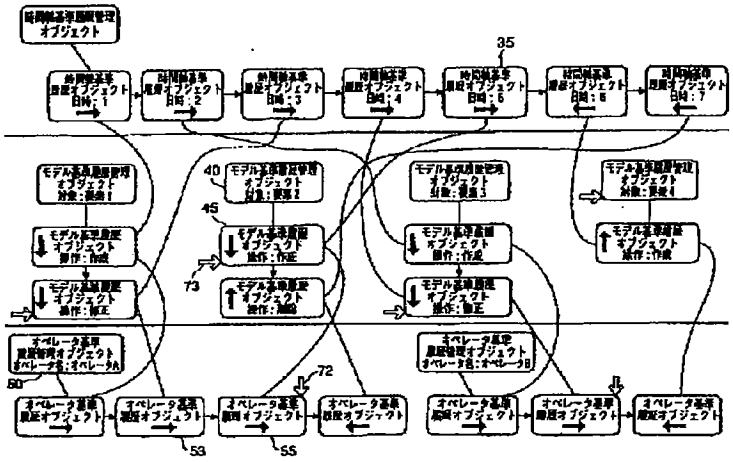


【図26】



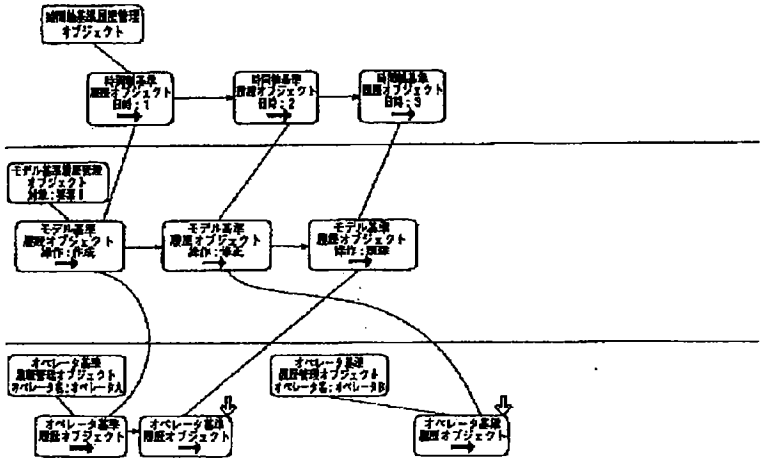
【図27】

設計者AによるRedo機能の実行



【図29】

2人の設計者の操作が干渉している例



【手続補正書】
【提出日】平成11年4月9日
【手続補正1】
【補正対象書類名】明細書
【補正対象項目名】特許請求の範囲
【補正方法】変更
【補正内容】
【特許請求の範囲】

【請求項1】 複数の設計者がチーム形式で行う設計作業において各設計者が行う各操作の内容を履歴情報として共通の履歴情報記憶手段に順次記録するとともに履歴情報の前記履歴情報記憶手段への記録順に基づいて直前の操作を取り消すためのアンドゥ機能を提供するCADシステムにおいて，
設計者が操作を行う度に，その操作が行われた時間情

報、その操作の対象となった設計対象に含まれる要素、その操作の種別及びその操作を行った設計者に関する情報を含む履歴情報を、有効と設定された操作の有効無効を表す情報と共に前記履歴情報記憶手段に記録する履歴情報収集手段と、

アンドゥ機能が実行されたときに対象となる操作を取り消すと共に前記履歴情報記憶手段に記録されている当該操作の履歴情報に対応した操作の有効無効を表す情報を無効に変更するアンドゥ機能制御処理手段と、

を有し、

前記アンドゥ機能制御処理手段は、設計者がアンドゥ機能を実行したときに当該設計者が行った直前の操作を取り消し、

前記履歴情報収集手段は、一操作に関する履歴情報を、時間軸基準、要素別及び設計者別に分類して管理することを特徴とするチーム形式設計用ＣＡＤシステム。

【手続補正２】

【補正対象書類名】明細書

【補正対象項目名】０００８

【補正方法】変更

【補正内容】

【０００８】

【課題を解決するための手段】以上のような目的を達成するために、本発明に係るチーム形式設計用ＣＡＤシステムは、複数の設計者がチーム形式で行う設計作業において各設計者が行う各操作の内容を履歴情報として共通の履歴情報記憶手段に順次記録するとともに履歴情報の前記履歴情報記憶手段への記録順に基づいて直前の操作を取り消すためのアンドゥ機能を提供するＣＡＤシステムにおいて、設計者が操作を行う度に、その操作が行われた時間情報、その操作の対象となった設計対象に含まれる要素、その操作の種別及びその操作を行った設計者に関する情報を含む履歴情報を、有効と設定された操作の有効無効を表す情報と共に前記履歴情報記憶手段に記録する履歴情報収集手段と、アンドゥ機能が実行されたときに対象となる操作を取り消すと共に前記履歴情報記憶手段に記録されている当該操作の履歴情報に対応した操作の有効無効を表す情報を無効に変更するアンドゥ機能制御処理手段とを有し、前記アンドゥ機能制御処理手段は、設計者がアンドゥ機能を実行したときに当該設計者が行った直前の操作を取り消し、前記履歴情報収集手段は、一操作に関する履歴情報を、時間軸基準、要素別及び設計者別に分類して管理することを特徴とする。

【手続補正３】

【補正対象書類名】明細書

【補正対象項目名】０００９

【補正方法】削除

【手続補正４】

【補正対象書類名】明細書

【補正対象項目名】００１０

【補正方法】削除

【手続補正５】

【補正対象書類名】明細書

【補正対象項目名】００１１

【補正方法】削除

【手続補正６】

【補正対象書類名】明細書

【補正対象項目名】００１２

【補正方法】削除

PATENT ABSTRACTS OF JAPAN

(11)Publication number : 11-288428

(43)Date of publication of application : 19.10.1999

(51)Int.Cl. G06F 17/50
G06T 1/00

(21)Application number : 10-091372

(22)Date of filing : 03.04.1998

(71)Applicant : TOYOTA KEERAMU:KK

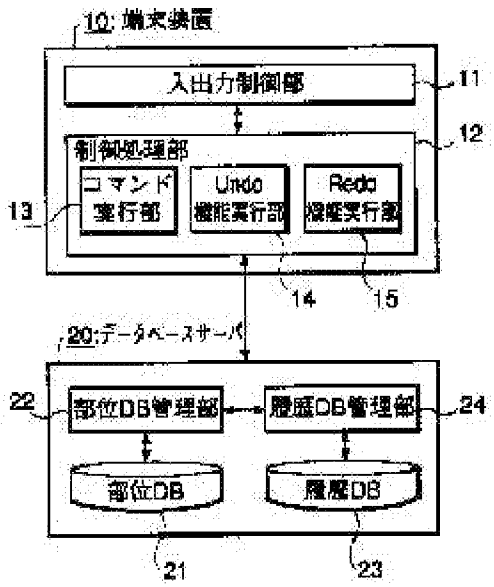
(72)Inventor : SANO HIROAKI

(54) CAD SYSTEM FOR TEAM TYPE DESIGN

(57)Abstract:

PROBLEM TO BE SOLVED: To provide an undo function or redo function which can be executed by designer units at the time of executing design of a team type.

SOLUTION: A database server 20 is provided with a part DB21 and a history DB23 commonly provided in the same team, and a history DB managing part 24 for collecting the history information of an operation executed by a designer, and recording it in the history DB23. The history information includes the date of the operation, the objective element of the operation, the classification of the operation, the designer of the operation, and the valid flag of the history information. When a designer executes an undo function in an operator reference mode, the history information of the operation executed by the designer is retrieved, and only the operation just previously executed by the designer is canceled, and any operation executed by the other designer in the same team is not canceled. Also, when a designer executes a redo function, the operation canceled when the designer just previously executes the undo function is restored, and the operation executed by the other designer in the same team is not restored.



LEGAL STATUS

[Date of request for examination]	10.06.1998
[Date of sending the examiner's decision of rejection]	
[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]	
[Date of final disposal for application]	
[Patent number]	2951312
[Date of registration]	09.07.1999
[Number of appeal against examiner's decision of rejection]	
[Date of requesting appeal against examiner's decision of rejection]	
[Date of extinction of right]	

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3.In the drawings, any words are not translated.

CLAIMS

[Claim(s)]
[Claim 1] While carrying out sequential record of the content of each actuation which each architect performs in the design which two or more architects do in a team format at a hysteresis information storage means common as hysteresis information In the CAD system which offers the undoing function for canceling the last actuation based on the order of record to said hysteresis information storage means of hysteresis information The hour entry to which the actuation was carried out whenever the architect operated it, the element contained in the object for a design set as the object of the actuation, A hysteresis information gathering means to record on said hysteresis information storage means with the information showing the effective invalid of the actuation set up in hysteresis information including the information about the architect who performed the classification and its actuation of the actuation as it is effective, An undoing functional control processing means to change into an invalid the information showing the effective invalid of the actuation corresponding to the hysteresis information on the actuation concerned currently recorded on said hysteresis information storage means while canceling the target actuation, when an undoing function is performed, It is the CAD system for a team formal design which **** and is characterized by said undoing functional control processing means canceling actuation when an architect performed an undoing function, just before the architect concerned carried out.
[Claim 2] It is the CAD system for a team formal design characterized by canceling either of the actuation just before following the time amount by which it was operated or operated just before the architect concerned carried out according to the mode selection by the architect, when, as for said undoing functional control processing means, an architect performed an undoing function in the CAD system for a team formal design according to claim 1.
[Claim 3] In the CAD system for a team formal design according to claim 1 It has a redo functional control processing means to change effectively the information showing the effective invalid of the actuation corresponding to the hysteresis information on the actuation concerned currently recorded on said hysteresis information storage means while reviving the actuation canceled by activation of the last undoing function, when a redo function is performed. The CAD system for a team formal design characterized by the architect concerned reviving the actuation canceled by activation of the last undoing function by searching said hysteresis information storage means when an architect performs a redo function.
[Claim 4] It is the CAD system for a team formal design carry out [reviving either of the actuation canceled by activation of an undoing function immediately before according to the time amount by which the actuation or the undoing function canceled by activation of the undoing function of the architect concerned according to the mode selection by the architect when, as for said redo functional control processing means, an architect performs a redo function in the CAD system according to claim 3 for a team formal design was performed, and] as the description.
[Claim 5] It is the CAD system for a team formal design characterized by classifying the hysteresis information concerning [on the CAD system for a team formal design according to claim 1, and / said

hysteresis information gathering means] one actuation a time amount shaft-basis and element exception and according to an architect, and managing.

[Translation done.]

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the block block diagram having shown the gestalt of 1 operation of the CAD system for a team formal design concerning this invention.
[Drawing 2] It is the block block diagram of the each terminal unit and database server which were shown in drawing 1 .
[Drawing 3] It is drawing having shown the fundamental example of a data configuration of the hysteresis database in the gestalt of this operation.
[Drawing 4] It is drawing having shown the example of a configuration of the time amount shaft-basis hysteresis managed table which constitutes the hysteresis database in the gestalt of this operation.
[Drawing 5] It is drawing having shown the example of a configuration of the model criteria hysteresis managed table which constitutes the hysteresis database in the gestalt of this operation.
[Drawing 6] It is drawing having shown the example of a configuration of the operator criteria hysteresis managed table which constitutes the hysteresis database in the gestalt of this operation.
[Drawing 7] It is drawing having shown typically the hysteresis data base manager before a design is started in the gestalt of this operation, and the content of setting out of a hysteresis database.
[Drawing 8] It is drawing having shown typically the content of setting out of the hysteresis information recorded in the gestalt of this operation.
[Drawing 9] It is drawing having shown typically the content of setting out of the hysteresis information recorded in the gestalt of this operation.
[Drawing 10] It is drawing having shown typically the content of setting out of the hysteresis information recorded in the gestalt of this operation.
[Drawing 11] It is drawing having shown typically the content of setting out of the hysteresis information recorded in the gestalt of this operation.
[Drawing 12] It is drawing having shown typically the content of setting out of the hysteresis information recorded in the gestalt of this operation.
[Drawing 13] It is drawing having shown typically the content of setting out of the hysteresis information recorded in the gestalt of this operation.
[Drawing 14] It is drawing having shown typically the content of setting out of the hysteresis information recorded in the gestalt of this operation.
[Drawing 15] It is the flow chart which showed the hysteresis information record processing in the gestalt of this operation.
[Drawing 16] It is drawing having shown typically the content of setting out of hysteresis information when a Undo function is performed in the gestalt of this operation at the time of operator criteria mode.
[Drawing 17] It is drawing having shown typically the content of setting out of hysteresis information when a Undo function is performed in the gestalt of this operation at the time of operator criteria mode.
[Drawing 18] It is drawing having shown typically the content of setting out of hysteresis information when a Undo function is performed in the gestalt of this operation at the time of operator criteria mode.
[Drawing 19] It is drawing having shown typically the content of setting out of hysteresis information

when a Undo function is performed in the gestalt of this operation at the time of operator criteria mode.
[Drawing 20] It is the flow chart which set in the gestalt of this operation and showed the Undo functional executive operation at the time of operator criteria mode.
[Drawing 21] It is drawing having shown typically the content of setting out of the hysteresis information when changing in the gestalt of this operation at the time of time-axis criteria mode.
[Drawing 22] It is the flow chart which showed processing at the time of a change in the time amount shaft-basis mode in the gestalt of this operation.
[Drawing 23] It is drawing having shown typically the content of setting out of hysteresis information when a Redo function is performed in the gestalt of this operation at the time of time-axis criteria mode.
[Drawing 24] It is the flow chart which set in the gestalt of this operation and showed the Redo functional executive operation at the time of time amount shaft-basis mode.
[Drawing 25] It is drawing having shown typically the content of setting out of hysteresis information when a Redo function is performed in the gestalt of this operation at the time of time-axis criteria mode.
[Drawing 26] It is drawing having shown typically the content of setting out of the hysteresis information when changing in the gestalt of this operation at the time of operator criteria mode.
[Drawing 27] It is drawing having shown typically the content of setting out of hysteresis information when a Redo function is performed in the gestalt of this operation at the time of operator criteria mode.
[Drawing 28] It is the flow chart which set in the gestalt of this operation and showed the Redo functional executive operation at the time of operator criteria mode.
[Drawing 29] It is drawing having shown typically the content of setting out of hysteresis information when two or more architects set the same element as the object of actuation in the gestalt of this operation.
[Drawing 30] It is drawing having shown the example of the procedure operated by the architect.
[Drawing 31] It is drawing having shown the example of a data configuration of the conventional hysteresis database.
[Description of Notations]
1 Network, 10 Terminal Unit, 11 I/O Control Unit, 12 Control Processing Section, 13 The command execution section, 14 The undoing functional activation section, 15 Redo functional activation section, 20 A database server, 21 Part database (DB), 22 The part database (DB) Management Department, 23 Hysteresis database (DB), 24 The hysteresis database (DB) Management Department, 30 Time amount shaft-basis hysteresis management object, A 31 - 37-hour shaft-basis hysteresis object, 40 A model criteria hysteresis management object, 41-46 A model criteria hysteresis object, 50 operator criteria hysteresis management object, 51-57 Operator criteria hysteresis object.

[Translation done.]

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to amelioration of the undoing (Undo) function which the CAD system used in order to design in a team format, especially the CAD system offer, and a redo (Redo) function.
[0002]
[Description of the Prior Art] The CAD system of the so-called team format which divides the appearance of the created automobile into two or more parts (component) used as a design unit, and designs at least each part in parallel simultaneously after that like the design of the former, for example, an automobile, when designing what consists of components which the object for a design is comparatively large-sized, and attain to a large number is introduced. Since two or more architects can do the concurrency of the design like each part and can advance it in each terminal unit for data processing in the CAD system to be used in case it designs in this team format, it becomes possible to aim at increase in efficiency of a design, and compaction of a design period as a whole. Moreover, when two or more components are contained to one part, the design of one part may be assigned to two or more architects, and a team may be formed for every part. Although the content of a design must be eventually summarized since each architect performs a design using each one of terminal units in this way, the formation of a ** disk space, the prevention of nonconformity with other architects of drawing, etc. are in the architect who designs one part and who prepares the common part database beforehand for every team, and belongs to the team by making the part database access.
[0003] Moreover, although the CAD commands, such as a design, correction, deletion, and migration, can be executed and the content of actuation can be reflected in a part database by making a keyboard, a mouse, etc. operate it in a CAD system, it has the function to collect the hysteresis information for the actuation of every. For example, when actuation is performed by the procedure as the architect A belonging to the same team and Architect B do a concurrency from a separate terminal unit to the same part and showed to drawing 30 , sequential record of the content of this actuation is carried out as hysteresis information at the hysteresis database formed not related according to an architect corresponding to the part database. The example of a content of this recorded hysteresis information is shown in drawing 31 . In drawing 31 , although the tabular format shows for convenience, each hysteresis information is generated as a hysteresis object. In addition, the "element" contained in drawing is a graphic form drawn by one commands, such as a straight line, a circle, and a square, one command is fundamentally executed by one actuation, and one graphic form is drawn. One part is designed by usually putting two or more elements together.
[0004] By the way, there is a case where he wants to cancel the element which drew by one actuation. The Redo function for reviving again the element canceled by the Undo function and Undo function for canceling the last actuation is prepared for the general CAD system, and the increase in efficiency of a design is attained.
[0005]

[Problem(s) to be Solved by the Invention] In the former however, in a hysteresis database Since it is recorded on the sequence operated in the condition of having been mixed by the hysteresis information on actuation by different architect, For example, if it is the conventional Undo function when based on the hysteresis information currently recorded on the hysteresis database shown in drawing 31 , it must perform twice to cancel "creation of element 4" actuation which Architect B did in the condition that actuation as shown in drawing 30 was carried out. That is, if Architect B does not cancel "deletion of element 2" actuation which performed the Undo function and Architect A did, he cannot cancel "creation of element 4" actuation. Therefore, when Architect A does not consent to cancellation of "deletion of element 2" actuation, "creation of element 4" actuation cannot be canceled using a Undo function.

[0006] Thus, in the former, even when it seems that he wants to cancel only actuation just before self carried out out of the actuation serially recorded in the condition of the architect of the same team having performed and having been mixed, both effective actuation must be canceled by using a Undo function. Or if a Undo function is performed, even when an element can be returned to the original condition, the new design equivalent to activation of a Undo function will occur, and it is not efficient.

[0007] It is made in order that this invention may solve the above problems, and the object is in offering the CAD system for a team formal design which offers the redo function to revive the actuation canceled by the undoing function per the undoing function as for which cancellation of actuation is made to an architect unit, or architect.

[0008]

[Means for Solving the Problem] In order to attain the above objects, the CAD system for a team formal design concerning this invention While carrying out sequential record of the content of each actuation which each architect performs in the design which two or more architects do in a team format at a hysteresis information storage means common as hysteresis information In the CAD system which offers the undoing function for canceling the last actuation based on the order of record to said hysteresis information storage means of hysteresis information The hour entry to which the actuation was carried out whenever the architect operated it, the element contained in the object for a design set as the object of the actuation, A hysteresis information gathering means to record on said hysteresis information storage means with the information showing the effective invalid of the actuation set up in hysteresis information including the information about the architect who performed the classification and its actuation of the actuation as it is effective, It has an undoing functional control processing means to change into an invalid the information showing the effective invalid of the actuation corresponding to the hysteresis information on the actuation concerned currently recorded on said hysteresis information storage means while canceling the target actuation, when an undoing function is performed. Said undoing functional control processing means is characterized by canceling actuation just before the architect concerned carried out, when an architect performs an undoing function.

[0009] Moreover, said undoing functional control processing means is characterized by canceling either of the actuation just before following the time amount by which it was operated or operated just before the architect concerned carried out according to the mode selection by the architect, when an architect performs an undoing function.

[0010] Moreover, it has a redo functional control processing means to change effectively the information showing the effective invalid of the actuation corresponding to the hysteresis information on the actuation concerned currently recorded on said hysteresis information storage means while reviving the actuation canceled by activation of the last undoing function, when a redo function is performed. When an architect performs a redo function, it is characterized by the architect concerned reviving the actuation canceled by activation of the last undoing function by searching said hysteresis information storage means.

[0011] Moreover, said redo functional control processing means carries out [reviving either of the actuation canceled by activation of an undoing function immediately before according to the time amount by which the actuation or the undoing function canceled by activation of the undoing function of the architect concerned according to the mode selection by the architect was performed, and] as the

description, when an architect performs a redo function.
[0012] Furthermore, said hysteresis information gathering means is characterized by classifying the hysteresis information about one actuation a time-axis criteria and element exception and according to an architect, and managing it.
[0013] According to this invention, actuation just before the architect who performed the undoing function out of the actuation which the architect belonging to a team performed carried out can be searched, and the actuation can be canceled.
[0014] Moreover, the architect who performed the redo function similarly can revive the actuation canceled by activation of the last undoing function.
[0015]
[Embodiment of the Invention] Hereafter, the gestalt of suitable operation of this invention is explained based on a drawing.
[0016] Drawing 1 is the block block diagram having shown the gestalt of 1 operation of the CAD system concerning this invention. The terminal unit 10 which each architect connected by the network 1 uses for drawing 1 , and the database server 20 which manages the various databases shared by the architect are shown.
[0017] Drawing 2 is the block block diagram of the each terminal unit 10 and database server 20 which were shown in drawing 1 . The terminal unit 10 has I/O control unit 11 which controls various input/output equipment which is not illustrated, such as a mouse and a display, and the control processing section 12 which performs control of others in a terminal unit 10 at large. The command execution section 13 which executes the CAD command directed to the architect, the undoing functional activation section 14 which performs an undoing function, and the redo functional activation section 15 which performs a redo function are contained in the control processing section 12. The application which can realize a terminal unit 10 at a CAD terminal general-purpose in hard, and is performed on equipment differs from the former. The gestalt of this operation has realized by application objects, such as an object for a display on the configuration data object which expresses the configuration data of each element, such as a line and a circle, for this, and the display screen showing an element.
[0018] on the other hand -- a database server -- 20 -- a design -- an object -- a configuration -- being related -- data -- storing -- a database -- managing -- although -- a book -- operation -- a gestalt -- **** -- a design -- an object -- a part -- every -- a team -- a format -- designing -- making -- **** -- since -- a configuration -- a database -- ****** -- preparing -- having -- **** -- a part -- a database -- (-- DB --) -- 21 -- managing -- **** . A part DB21 is an object oriented database, and stores a part or the configuration data object of components. The part database (DB) Management Department 22 performs an update process of a part DB21 etc. based on the configuration data object with which generation, deletion, etc. are carried out by activation of the CAD command. Furthermore, the part DB Management Department 22 directs record of hysteresis information to the hysteresis database (DB) Management Department 24 with registration of a configuration data object etc. The hysteresis DB Management Department 24 is a hysteresis information gathering means to collect the hysteresis of the actuation which an architect performs in a design, and to record on the hysteresis database (DB) 23 serially. Moreover, the hysteresis DB Management Department 24 constitutes an undoing functional control processing means to change with an invalid the information showing the effective invalid of the actuation corresponding to the hysteresis information on the actuation concerned currently recorded on hysteresis DB23, with the undoing functional activation section 14 while canceling the target actuation, when an undoing function is performed. Furthermore, when a redo function is performed, while reviving the actuation canceled by activation of the last undoing function, a redo functional control processing means change the information showing the effective invalid of the actuation corresponding to the hysteresis information on the actuation concerned currently recorded on hysteresis DB23 as it is effective is constituted with the redo functional activation section 15.
[0019] Drawing 3 is drawing having shown the fundamental example of a data configuration of the hysteresis DB23 in the gestalt of this operation. The information about the actuation whenever an architect operates it is accumulated in hysteresis DB23 as hysteresis information. The information

showing the architect who performed classification of the actuation, such as a hour entry to which the actuation was carried out, an element contained in the object for a design set as the object of the actuation, creation, and correction, and its actuation, and the effective invalid of the actuation is included in each hysteresis information, and it is expressed with "time", an "object", "actuation", an "architect", and an "effective flag" in drawing 3 , respectively When the content of actuation revives by activation of the time of being recorded newly, or a redo function, it becomes effective and "validity" is canceled by activation of an undoing function, an "invalid" is set to an effective flag. In addition, although the flag information of an "effective flag" expressed the effective invalid of the content of actuation with the gestalt of this operation, it is also possible to make it express with other expression methods, for example, pointer information.

[0020] It being characteristic in the gestalt of this operation is having enabled it to perform an undoing function and a redo function for every architect by having given the information about an architect to hysteresis information. For example, when actuation is carried out in the procedure shown in drawing 30 and Architect B wants to cancel "creation of element 4" actuation, Architect B can cancel only "creation of element 4" actuation which self carried out, without canceling "deletion of element 2" actuation which Architect A did by performing a Undo function once.

[0021] By the way, with the gestalt of this operation, coexistence with the so-called Undo function of time-axis criteria and the Redo function in which the operated same time amount as usual was met, and the Undo function of an architect unit and Redo function which are the description of the gestalt of this operation and which were operated is enabled. moreover -- since the object has realized each function in the gestalt of this operation -- more -- operation -- since it is easy, hysteresis DB23 has been realized by different DS from having been actually shown in drawing 3 . The DS of the hysteresis DB23 used in the gestalt of this the operation of this is explained.

[0022] In the gestalt of this operation, hysteresis information was divided into three criteria and managed. One is the hysteresis information on the basis of a time-axis, and it shows this to drawing 4 in the table format of a time amount shaft-basis hysteresis managed table. One is the hysteresis information on the basis of the element made applicable to actuation, and it shows this to drawing 5 in the table format of a model criteria hysteresis managed table. Remaining one is the hysteresis information on the basis of the architect who operated it, and it shows this to drawing 6 in the table format of an operator criteria hysteresis managed table. Although expressed with drawing 4 thru/or drawing 6 in the table format for convenience, each hysteresis information is formed by one object. Whenever an architect operates it, hysteresis information will be related with each table, respectively, and it will be recorded.

[0023] first, to the hysteresis information on a time amount shaft-basis hysteresis managed table "SeqNo." which shows the order of record, the "time" which shows the time of day when actuation was carried out, The "effective flag" showing the effective invalid of the actuation corresponding to the hysteresis information concerned as information, The "model criteria hysteresis pointer" for relating with the hysteresis information on the model criteria hysteresis managed table recorded corresponding to the hysteresis information concerned, The "before hysteresis information pointer" which cooperates the hysteresis information recorded immediately before on the "hysteresis [degree] information pointer" which cooperates the hysteresis information recorded immediately after on the time amount shaft-basis hysteresis managed table, and the time amount shaft-basis hysteresis managed table is contained. Each hysteresis information will be a fixed length, and a "hysteresis [degree] information pointer" and a "before hysteresis information pointer" will be unnecessary information if a time amount shaft-basis hysteresis managed table is formed in a continuation field. Moreover, as long as it can connect with the time order which had each hysteresis information operated, you may realize by other approaches. Moreover, since the once recorded hysteresis information was not eliminated even if it was canceled by the Undo function in principle, it formed the "effective hysteresis pointer" so that it could grasp easily which actuation is effective, even if it did not check an "effective flag." That is, an effective hysteresis pointer points out the hysteresis information located in an end among effective hysteresis information trains. If there is even either information of an "effective hysteresis pointer" and an "effective flag", it is possible to operate this system normally, but with the gestalt of this operation, in order to attain speeding

up of processing, both sides are prepared. If "Seq No." of hysteresis information is set to an "effective hysteresis pointer", the end of effective actuation can be shown easily. Whenever actuation is performed, hysteresis information is accumulated in the time amount shaft-basis hysteresis managed table. In this hysteresis information, the information (this example "model criteria hysteresis pointer") for carrying out correlation with a hour entry (this example "time") and the hysteresis information on other tables is indispensable data.

[0024] The table having shown in the model criteria hysteresis managed table for every element at drawing 5 is generated. The "operator criteria hysteresis pointer" for relating with the hysteresis information on the "time-amount shaft-basis hysteresis pointer" for relating with the hysteresis information on the time-amount shaft-basis hysteresis managed table recorded corresponding to "actuation" which shows the classification of actuation, such as creation and correction, and the hysteresis information concerned, and the operator criteria hysteresis managed table which were recorded corresponding to the hysteresis information concerned is contained in the hysteresis information here. Since the hysteresis information on other "Seq No.", an "effective flag", a "hysteresis [degree] information pointer", and a "before hysteresis information pointer" and an "effective hysteresis pointer" are the same as that of a time amount shaft-basis hysteresis managed table, explanation is omitted. in a model criteria hysteresis managed table, the information (this example -- a "time amount shaft-basis hysteresis pointer" and an "operator criteria hysteresis pointer") for carrying out correlation with the "element name" equivalent to the "object" of drawing 3 and the hysteresis information on other tables is indispensable data.

[0025] The table having shown in the operator criteria hysteresis managed table for every architect at drawing 6 is generated. Although "Seq No.", the "effective flag", the "model criteria hysteresis pointer", the "hysteresis [degree] information pointer", and the "before hysteresis information pointer" are contained in the hysteresis information here, since each information is the same as that of each above-mentioned table, explanation is omitted. In an operator criteria hysteresis managed table, the information (this example "model criteria hysteresis pointer") for carrying out correlation with the "operator name" equivalent to the "architect" of drawing 3 and the hysteresis information on other tables is indispensable data. In addition, although it can relate with the hysteresis information on a time amount shaft-basis hysteresis managed table indirectly through the hysteresis information on a model criteria hysteresis managed table, a "time amount shaft-basis hysteresis pointer" may be directly included in hysteresis information.

[0026] Next, although the actuation in the gestalt of this operation is explained, hysteresis information is recorded on hysteresis DB23, and by performing actuation in the procedure shown in drawing 30 explains the case where a Undo function and a Redo function are performed after that here, using drawing after drawing 7 which showed typically the content of the object shown in the table format in drawing 4 thru/or drawing 6 . Moreover, in the gestalt of this operation, the team shall be formed in Architects (operator) A and B.

[0027] First, in Architects A and B, before a design is started, the part DB21 and hysteresis DB23 which are shared between the team are prepared. In addition, the time amount shaft-basis hysteresis management object 30 in drawing 7 is equivalent to the "effective hysteresis pointer" of the time amount shaft-basis hysteresis managed table shown in drawing 4 at "operator name" + "an effective hysteresis pointer", respectively. [of the operator criteria hysteresis managed table having shown each architect's operator criteria hysteresis management object 50 at drawing 6] Moreover, the model criteria hysteresis management object 40 explained later on will be equivalent to "element name" + "an effective hysteresis pointer". [of the model criteria hysteresis managed table shown in drawing 5]

[0028] Record **** to the hysteresis DB of hysteresis information and hysteresis information explain to drawing 8 thru/or drawing 14 the actuation recorded on hysteresis DB23 using the flow chart shown in the transition diagram and drawing 15 of the hysteresis information shown typically.

[0029] The configuration data object with which the command execution section 13 understood "creation of element 1" actuation by Architect A, and was generated is transmitted to a database server 20 through a network 1. The part DB Management Department 22 registers the sent configuration data

object into a part DB21. Furthermore, the hysteresis DB Management Department 24 is notified of the registered purport with the information about the actuation "Architect A created the element 1." The hysteresis DB Management Department 24 records hysteresis information on hysteresis DB23 based on the content of the received advice. That is, as shown in drawing 8 , the time amount shaft-basis hysteresis object 31, the model criteria hysteresis object 41, and the operator criteria hysteresis object 51 equivalent to each hysteresis information on three kinds of tables mentioned above are generated (step 101,104,106).

[0030] First, in step 101, although "validity" is set up and generated by the time of day and the "effective flag" which were operated by the "time" at the time amount shaft-basis hysteresis object 31, in the gestalt of this operation, the information on time will be shown in order of the record which is only equivalent to "Seq No." Moreover, an "effective flag" will express an "effective" purport with arrow-head 31a of the right sense. Thus, the generated time amount shaft-basis hysteresis object 31 is managed by the time amount shaft-basis hysteresis management object 30.

[0031] Next, when the element used as a processing object is new, the hysteresis DB Management Department 24 generates the model criteria hysteresis management object 40 to the element concerned inside with the advice, and makes actuation start (step 102,103). In the case of this example, the model criteria hysteresis management object 40 to an element 1 is generated inside. In step 104, although "validity" is set as the "actuation" by "creation" and an "effective flag" at the model criteria hysteresis object 41, in the gestalt of this operation, an "effective flag" will express an "effective" purport with downward arrow-head 41a. And it connects with the model criteria hysteresis management object 40 to an element 1, and the end (here model criteria hysteresis object 41) of the object corresponding to effective actuation is further pointed out by the arrow head 71 in the train of the model criteria hysteresis object of an element 1 (step 105). This arrow head 71 is equivalent to the effective hysteresis pointer of a model criteria hysteresis managed table. Thus, the generated model criteria hysteresis object 41 is managed by the corresponding model criteria hysteresis management object 40.

[0032] In addition, when a Undo function is performed, it is necessary to return the element used as the object for actuation to the original condition. If it puts in another way, it is necessary to return a configuration data object to the condition in front of a certain actuation. Moreover, when a Redo function is performed, it is necessary to return further the element which returned to the original condition by activation of a Undo function. In order to make this possible, he relates with a model criteria hysteresis object the backup-status information about the element which became an object for actuation whenever the actuation to a certain element was made, and is trying to hold it with the gestalt of this operation, but about this processing, since it is not the summary of this invention, explanation is omitted.

[0033] In step 106, although "validity" is set as the "effective flag" by the operator criteria hysteresis object 51, in the gestalt of this operation, an "effective flag" will express an "effective" purport with arrow-head 51a of the right sense. The operator criteria hysteresis object 51 is connected with the operator criteria hysteresis management object 50 to Operator A, and points out the end (here operator criteria hysteresis object 51) of the object train corresponding to effective actuation by the arrow head 72 in the train of Operator's A operator criteria hysteresis object further (step 107). This arrow head 72 is equivalent to the effective hysteresis pointer of an operator criteria hysteresis managed table. And each newly recorded hysteresis objects 31, 41, and 51 are associated with a time amount shaft-basis hysteresis pointer, a model criteria hysteresis pointer, and an operator criteria hysteresis pointer as they explained each above-mentioned table using drawing 4 thru/or drawing 6 . This associated situation is expressed with lines 61 and 62 at drawing 8 .

[0034] Next, the configuration data object with which the command execution section 13 understood "creation of element 3" actuation by Architect B, and was generated is transmitted to a database server 20 through a network 1. The part DB Management Department 22 registers the sent configuration data object into a part DB21. Furthermore, the hysteresis DB Management Department 24 is notified of the registered purport with the information about the actuation "Architect B created the element 3." The hysteresis DB Management Department 24 records hysteresis information on hysteresis DB23 based on

the received content of advice. That is, as shown in drawing 9 , the time amount shaft-basis hysteresis object 32, the model criteria hysteresis object 42, and the operator criteria hysteresis object 52 equivalent to each hysteresis information on three kinds of tables mentioned above are generated (step 101,104,106). The content is set up by the same processing as the above.

[0035] First, the time amount shaft-basis hysteresis object 32 generated in step 101 is connected immediately after the time amount shaft-basis hysteresis object 31 already recorded. The information equivalent to the hysteresis [degree (before)] information pointer of a time amount shaft-basis hysteresis managed table is expressed with a line 63. In addition, the setting-out approach of the content of the time amount shaft-basis hysteresis object 32 is the same as the above.

[0036] Next, since the element 3 used as a processing object is new, the model criteria hysteresis management object 40 to an element 3 is generated inside, and actuation is made to start (step 102,103). In addition, the content of the model criteria hysteresis object 42 and the setting-out approach of an effective hysteresis pointer are the same as the above.

[0037] And it carries out like the time of "creation of element 1" actuation by the architect A who also mentioned above generation of the operator criteria hysteresis object 52 to Operator B (step 106,107).

[0038] Next, the configuration data object with which the command execution section 13 understood the "correction of element 1" actuation by Architect A, and was generated is transmitted to a database server 20 through a network 1. The part DB Management Department 22 registers the sent configuration data object into a part DB21. Furthermore, the part DB Management Department 22 notifies the hysteresis DB Management Department 24 of the registered purport with the information about the actuation "Architect A corrected the element 1." The hysteresis DB Management Department 24 records hysteresis information on hysteresis DB23 based on the content of advice. That is, as shown in drawing 10 , the time amount shaft-basis hysteresis object 33, the model criteria hysteresis object 43, and the operator criteria hysteresis object 53 equivalent to each hysteresis information on three kinds of tables mentioned above are generated (step 101,104,106). Each content of each hysteresis objects 33, 43, and 53 is set up like the above. Among these, "validity" is set as the time of day and the "effective flag" which were operated by the time amount shaft-basis hysteresis object 33 in the "time" (step 101). And it connects with the tail end of the hysteresis object which the time amount shaft-basis hysteresis management object 30 manages. "Validity" is set as the "actuation" by "correction" and an "effective flag" at the model criteria hysteresis object 43 (step 104). In addition, since the model criteria hysteresis management object 40 to an element 1 is generation ending, the arrow head 71 which the model criteria hysteresis object 43 is connected with the tail end of the hysteresis object which the model criteria hysteresis management object 40 to this element 1 manages, and is equivalent to an effective hysteresis pointer in connection with this is moved to this model criteria hysteresis object 43 (step 105). "Validity" is set as the "effective flag" by the operator criteria hysteresis object 53 (step 106). And the arrow head 72 which the operator criteria hysteresis object 53 is connected with the tail end of the hysteresis object which the operator criteria hysteresis management object 50 to Operator A manages, and is equivalent to an effective hysteresis pointer in connection with this is moved to this model criteria hysteresis object 53 (step 107). In addition, processing of correlation with the hysteresis information in front of others and the hysteresis information on other tables etc. is performed like the above.

[0039] Sequential record can be carried out at hysteresis DB23 by repeating the processing which also mentioned above the hysteresis information corresponding to each actuation from correction of the element 3 by the architect B who showed drawing 30 , and who mentions later to deletion of an element 2, and performing it. The condition that each hysteresis object was recorded by each subsequent actuation is shown in drawing 11 thru/or drawing 14 .

[0040] Although it is characterized by the gestalt of this operation enabling it to perform a Undo function for every architect as the Undo function carried out the activation (operator criteria mode) above-mentioned Next, the actuation in the gestalt of this operation when a Undo function is performed is explained to drawing 14 , drawing 16 , or drawing 19 using the flow chart shown in the transition diagram and drawing 20 of the hysteresis information shown typically from the condition which recorded hysteresis information as shown in drawing 14 . In addition, although the time-axis criteria

mode performed according to the time amount operated like the Undo function and the former in the operator criteria mode in which a Undo function is performed per operator (architect) is offered with the gestalt of this operation, processing when operator criteria mode is chosen here is explained.
[0041] First, the hysteresis information currently recorded on the hysteresis DB23 before a Undo function is performed is in the condition shown in drawing 14 , and since the effective flag of all hysteresis objects is set up effectively, the arrow heads 71, 73, 74, and 75 of an effective hysteresis pointer have pointed out the end of the train of the model criteria hysteresis object in each elements 1-4. Similarly, the arrow heads 72 and 76 of an effective hysteresis pointer have pointed out the end of the train of each operator criteria hysteresis object.
[0042] Suppose that Architect A performed the Undo function in this condition. This actuation is equivalent to cancellation directions of "deletion of element 2" actuation in this example based on drawing 30 . This actuation is understood by the Undo functional activation section 14, and is transmitted to a database server 20 through a network 1. An architect name (=A) and an actuation name (=Undo) are included in the content of actuation transmitted. The hysteresis DB Management Department 24 discovers the operator criteria hysteresis management object 50 to Architect A with activation of a Undo function (step 111), and an effective flag changes the effective flag of the operator criteria hysteresis object 54 of an "effective" end "invalid" among the trains of the operator criteria hysteresis object which the operator criteria hysteresis management object 50 concerned manages (step 112). The operator criteria hysteresis object 54 which corresponds since he is trying to point out the corresponding operator criteria hysteresis object 54 by the arrow head 72 of an effective hysteresis pointer can be immediately searched with the gestalt of this operation. In addition, in the gestalt of this operation, an "effective flag" will express an "invalid" purport with arrow-head 54b of the left sense. Then, it is located just before the operator criteria hysteresis object 54 which repealed the effective flag, and the arrow head 72 of an effective hysteresis pointer is moved to the operator criteria hysteresis object 55 whose effective flag is the end of an "effective" hysteresis information train (step 113). Next, the effective flag of the model criteria hysteresis object 44 connected from the model criteria hysteresis management object 40 to the element 2 in the hysteresis information, i.e., drawing 16 , of a model criteria hysteresis managed table associated by the model criteria hysteresis pointer of the hysteresis information (operator criteria hysteresis object 54) made into the invalid of an operator criteria hysteresis managed table is changed "invalid" (step 114). In addition, in the gestalt of this operation, an "effective flag" will express an "invalid" purport with upward arrow-head 44b.
[0043] the status information in front of the actuation activation to the element for Undo which relates with a model criteria hysteresis object and is held in hysteresis DB23 here -- using -- the part DB Management Department 22 -- leading -- a part DB21 -- as follows -- a case -- dividing -- carrying out -- changing (step 115) .
[0044] In Undo of "creation" actuation, a configuration data object will not exist. In addition, it leaves the configuration data object concerned as it is for future Redo functional activation. In Undo of "correction" actuation, the configuration data object which is in a part DB21 using the status information in front of the actuation activation to the backed up element for Undo is changed. In Undo of "deletion" actuation, the configuration data object which it left is re-registered into the set of an effective existing configuration data object. In this example, since it corresponds in Undo of "deletion" actuation, the configuration data object of the element 2 held at the time of "deletion" actuation is revived by re-registering with the set of an effective configuration data object.
[0045] Then, the hysteresis DB Management Department 24 is located just before the model criteria hysteresis object 44 which repealed the effective flag, and moves the arrow head 73 of an effective hysteresis pointer to the model criteria hysteresis object 45 whose effective flag is the end of an "effective" hysteresis information train (step 116). And the effective flag of the time amount shaft-basis hysteresis object 37 in the hysteresis information, i.e., drawing 16 , of a time amount shaft-basis hysteresis managed table associated by the time amount shaft-basis hysteresis pointer of a model criteria hysteresis managed table is changed "invalid" (step 117). In addition, in the gestalt of this operation, an "effective flag" will express an "invalid" purport with arrow-head 37b of the left sense.

[0046] As mentioned above, when a Undo function is performed, only processing which moves the processing and the effective hysteresis pointer which make an invalid the effective flag of the hysteresis object which corresponds to hysteresis DB23 is performed. In addition, since the processing mentioned above is processing at the time of the Undo functional activation in operator criteria mode, migration of the effective hysteresis pointer which the time amount shaft-basis hysteresis management object 30 manages is not indispensable processing.
[0047] Next, suppose that Architect A performed the Undo function continuously. This actuation is equivalent to cancellation directions of "creation of element 2" actuation in this example based on drawing 30 . If this actuation is performed, the hysteresis DB Management Department 24 will be notified of the information "Architect A canceled "creation of element 2" actuation", and processing at the time of the following Undo functional activation will be performed.
[0048] First, an effective flag changes the effective flag of the operator criteria hysteresis object 55 of an "effective" end "invalid" among the trains of the operator criteria hysteresis object which the operator criteria hysteresis management object 50 to Architect A manages (step 111). Then, it is located just before the operator criteria hysteresis object 55 which repealed the effective flag, and the arrow head 72 of an effective hysteresis pointer is moved to the operator criteria hysteresis object 53 whose effective flag is the end of an "effective" hysteresis information train (step 112).
[0049] Next, the effective flag of the model criteria hysteresis object 45 connected from the model criteria hysteresis management object 40 to the element 2 in the hysteresis information, i.e., drawing 17 , of a model criteria hysteresis managed table associated by the model criteria hysteresis pointer of the hysteresis information (operator criteria hysteresis object 55) made into the invalid of an operator criteria hysteresis managed table is changed "invalid" (step 114). Then, an effective flag tends to move the arrow head 73 of an effective hysteresis pointer to the end of an "effective" hysteresis information train (step 116). Here, although the corresponding model criteria hysteresis object does not exist, in preparation for activation of a Redo function, the model criteria hysteresis management object 40 to an element 2 is pointed out. Of course, each model criteria hysteresis object is not eliminated in order to carry out record maintenance as hysteresis information. In addition, in subsequent explanation, an effective flag will express suitably the model criteria hysteresis object to which it is set as "validity/invalid" with an only effective / invalid model criteria hysteresis object.
[0050] Then, the effective flag of the time amount shaft-basis hysteresis object 35 in the hysteresis information, i.e., drawing 17 , of a time amount shaft-basis hysteresis managed table associated by the time amount shaft-basis hysteresis pointer of a model criteria hysteresis managed table is changed "invalid" (step 117).
[0051] According to the gestalt of this operation, "creation of element 4" actuation of Architect B which only the actuation which Architect A did by activation of the Undo function by Architect A was canceled, and was carried out after "creation of element 2" actuation by Architect A is still effective as it was shown in the time-amount shaft-basis hysteresis object 36 connected with the time-amount shaft-basis hysteresis management object 30.
[0052] Next, suppose that Architect B performed the Undo function. This actuation is equivalent to cancellation directions of "creation of element 4" actuation in this example based on drawing 30 . If this actuation is performed, the hysteresis DB Management Department 24 will be notified of the information "Architect B canceled "creation of element 4" actuation", and processing at the time of the following Undo functional activation will be performed.
[0053] First, an effective flag changes the effective flag of the operator criteria hysteresis object 56 of an "effective" end "invalid" among the trains of the operator criteria hysteresis object which the operator criteria hysteresis management object 50 to Architect B manages (step 112). The operator criteria hysteresis object 56 which corresponds since he is trying to point out the corresponding operator criteria hysteresis object 54 by the arrow head 76 of an effective hysteresis pointer can be immediately searched with the gestalt of this operation. Then, it is located just before the operator criteria hysteresis object 56 which repealed the effective flag, and the arrow head 76 of an effective hysteresis pointer is moved to the operator criteria hysteresis object 57 whose effective flag is the end of an "effective" hysteresis

information train (step 113).
[0054] Next, the effective flag of the model criteria hysteresis object 46 connected from the model criteria hysteresis management object 40 to the element 4 in the hysteresis information, i.e., drawing 18 , of a model criteria hysteresis managed table associated by the model criteria hysteresis pointer of the hysteresis information (operator criteria hysteresis object 56) made into the invalid of an operator criteria hysteresis managed table is changed "invalid" (step 114). Then, an effective flag tends to move the arrow head 75 of an effective hysteresis pointer to the end of an "effective" hysteresis information train (step 116). Here, although the corresponding model criteria hysteresis object does not exist, in preparation for activation of a Redo function, the model criteria hysteresis management object 40 to an element 4 is pointed out. Of course, each model criteria hysteresis object is not eliminated in order to carry out record maintenance as hysteresis information.
[0055] Then, the effective flag of the time amount shaft-basis hysteresis object 36 in the hysteresis information, i.e., drawing 18 , of a time amount shaft-basis hysteresis managed table associated by the time amount shaft-basis hysteresis pointer of a model criteria hysteresis managed table is changed "invalid" (step 117).
[0056] Thus, only actuation just before being based on Architect B can be canceled, without affecting the hysteresis information based on actuation of Architect A in any way also to activation of the Undo function by Architect B. Then, only "correction of element 1" actuation just before being based on Architect A can be canceled, without affecting the hysteresis information based on actuation of Architect B in any way, if the above-mentioned processing is followed even when Architect A performs a Undo function further and cancels "correction of element 1" actuation. The condition of the hysteresis information at this time is shown in drawing 19 .
[0057] Processing when activation (time-axis criteria mode) of a Undo function, next time-axis criteria mode are chosen is explained.
[0058] Although it will cancel in the Undo function in time-axis criteria mode sequentially from the actuation which set in the team according to the time amount operated not related according to an architect as usual, and was made into just before, since cancellation of actuation is performed without being restricted by the time-axis, in the operator criteria mode mentioned above, an effective time-axis criteria hysteresis object does not necessarily exist continuously. Specifically, the time amount shaft-basis hysteresis object 34 effective in the latter part of the invalid time amount shaft-basis hysteresis object 33 may exist as shown in drawing 19 . If possible, he wants to make this intermittence condition canceled since it cannot say that such a condition is desirable when performing the Undo function by the time-axis criteria mode in which the last actuation is canceled one by one. So, in a database server 20, processing in which the effective time amount shaft-basis hysteresis object which agreed on predetermined conditions at the time of a change in time amount shaft-basis mode is automatically made into an invalid is performed. This processing is explained to drawing 19 and drawing 21 using the flow chart shown in the transition diagram and drawing 22 of the hysteresis information shown typically.
[0059] When choosing time amount shaft-basis mode, it makes it specify which time amount shaft-basis hysteresis object to be automatically made into an invalid supposing the case where the effective time amount shaft-basis hysteresis object is not continuing. The control processing section 12 of each terminal unit 10 has the list of hysteresis information sent from the hysteresis DB Management Department 24, and an architect can be made to specify by displaying the list on a display. For example, the time amount shaft-basis hysteresis object 32 is made to specify in drawing 21 at the time of selection in time amount shaft-basis mode to make more nearly automatically than the time amount shaft-basis hysteresis object 32 of "time:2" a latter time amount shaft-basis hysteresis object into an invalid. In addition, having not carried out processing for which the effective hysteresis pointer which the time amount shaft-basis hysteresis management object 30 manages is moved at the time of the Undo functional activation in operator criteria mode In the time of activation of the Undo function by operator criteria mode, a time amount shaft-basis hysteresis object does not necessarily become continuously, and with the gestalt of this operation It is because there is no semantics in performing the processing concerned since it was made to make the location of the time amount shaft-basis hysteresis object made

into an invalid specify at the time of a mode change not much.
[0060] First, the time amount shaft-basis hysteresis object 37 in the end of the time amount shaft-basis hysteresis object train begun from the time amount shaft-basis hysteresis management object 30 is acquired (step 121). Since the time amount shaft-basis hysteresis object 37 concerned is the latter part and is already made into the invalid from the specified time amount shaft-basis hysteresis object 32, it processes nothing. And the time amount shaft-basis hysteresis object 36 which is just before that is acquired (step 122,123,128). Since this time amount shaft-basis hysteresis object 36 and also the time amount shaft-basis hysteresis objects 35 and 34 are also made into the invalid, nothing is processed similarly. Then, the time amount shaft-basis hysteresis object 33 is acquired (step 121). Since the time amount shaft-basis hysteresis object 33 concerned is the latter part and its effective flag is more "effective" than the specified time amount shaft-basis hysteresis object 32, the effective flag of this time amount shaft-basis hysteresis object 33 is changed "invalid" (step 124). And the effective flag of the model criteria hysteresis object 43 related with the time amount shaft-basis hysteresis object 33 is changed "invalid" (step 125). And about this processing, although a part DB21 is changed through the part DB Management Department 22 using the status information in front of the actuation activation to the element for Undo which relates with the model criteria hysteresis object 43, and is held in hysteresis DB23 (step 126), since it is the same as that of step 115 of drawing 20 , detailed explanation is omitted. Then, the hysteresis DB Management Department 24 changes the effective flag of the operator criteria hysteresis object 53 "invalid" (step 127). Next, since the time amount shaft-basis hysteresis object 32 which is just before the time amount shaft-basis hysteresis object 33 is a specified hysteresis object, it ends processing here (step 128,122). This condition is shown in drawing 21 .
[0061] According to the gestalt of this operation, it can carry out regulating automatically so that an invalid time amount shaft-basis hysteresis object may become continuously as mentioned above at the time of a change in time amount shaft-basis mode. What is necessary is just to perform processing shown in the above-mentioned steps 124-126 in this case that what is necessary is just to cancel one by one from the hysteresis object to which it was pointed out by the effective hysteresis pointer 77 which a time amount shaft-basis hysteresis management object manages, when a Undo function is performed next. In addition, since it does not use at the time of activation of the Undo function in time-axis criteria mode, it is not necessary to not necessarily move the effective hysteresis pointer which the model criteria hysteresis management object 40 and the operator criteria hysteresis management object 50 manage according to modification of an effective flag. At the time of a change in operator criteria mode, it can reset automatically by referring to the effective flag of each hysteresis object.
[0062] By the way, in the gestalt of this operation, when change processing to time-axis criteria mode is performed in the middle of a design, there is a possibility that it may be compulsorily canceled to actuation not to cancel or actuation by other architects. For this reason, caution is required to a mode change. However, if this outputs the message actuation for automatic cancellation, and for a check to each terminal unit 10 or actuation for automatic cancellation is based on other architects when mode change directions are carried out from one of architects, it is [this] possible in coping with it by preparing an adjustment function at the time of the mode change which performs various adjustments, such as controlling a mode change.
[0063] Processing when a Redo function is performed in activation (time-axis criteria mode) of a Redo function, next time-axis criteria mode is explained.
[0064] The Undo function which set it in the team not related according to an architect as usual, and was performed immediately before is made revitalized in the Redo function in time amount shaft-basis mode. That is, although it will be shown in drawing 23 if a Redo function is performed in the condition of drawing 21 , the actuation at this time is explained using the flow chart shown in drawing 24 .
[0065] Suppose that one of architects performed the Redo function. According to drawing 21 , it is equivalent to revival directions of the "correction of element 1" actuation by Architect A. This actuation is understood by the Redo functional activation section 15, and is transmitted to a database server 20 through a network 1. An architect name (=A) and an actuation name (=Redo) are included in the content of actuation transmitted. Although the hysteresis DB Management Department 24 is first made into the

invalid with activation of a Redo function among the time amount shaft-basis hysteresis objects connected with the time amount shaft-basis hysteresis management object 30, it acquires the time amount shaft-basis hysteresis object 33 located in a head (step 131). In addition, this time amount shaft-basis hysteresis object 33 can be easily obtained also from the location of the effective hysteresis pointer shown by the arrow head 77. And the effective flag of the time amount shaft-basis hysteresis management object 30 is changed effectively (step 132). Then, it is made to move so that the time amount shaft-basis hysteresis object 33 which confirmed the effective hysteresis pointer may be pointed out (step 133). And the effective flag of the model criteria hysteresis object 43 related with the time amount shaft-basis hysteresis object 33 is changed effectively (step 134).

[0066] the status information which relates with a model criteria hysteresis object and is held in hysteresis DB23 here -- using -- the part DB Management Department 22 -- leading -- a part DB21 -- as follows -- a case -- dividing -- carrying out -- changing (step 135) .

[0067] In Redo of "creation" actuation, the configuration data object which it left is re-registered into the set of an effective existing configuration data object. In Redo of "correction" actuation, the configuration data object which is in a part DB21 using the status information immediately after the actuation activation to the backed up element for Redo is changed. In Redo of "deletion" actuation, a configuration data object will not exist. In addition, it leaves the configuration data object concerned as it is for Undo functional activation for the second time. In this example, since it corresponds in Redo of "correction" actuation, a configuration data object will be changed using the backed up status information.

[0068] Then, the hysteresis DB Management Department 24 changes effectively the effective flag of the operator criteria hysteresis object 53 (step 136). In addition, in the gestalt of this operation, the arrow head 71 of the effective hysteresis pointer which the model criteria hysteresis management object 40 manages as shown in drawing 23 is moved to the model criteria hysteresis object 43. Furthermore, a condition when a Redo function is performed is shown in drawing 25 .

[0069] According to the gestalt of this operation, it can do in this way and the same Redo function as usual can be offered.

[0070] Processing when a Redo function is performed in activation (operator criteria mode) of a Redo function, next operator criteria mode is explained. In addition, the effective hysteresis pointer which the model criteria hysteresis management object 40 and the operator criteria hysteresis management object 50 manage, respectively is always moved so that data conflict may not be caused at the time of time amount shaft-basis mode. The condition when operator criteria mode is chosen as drawing 26 in drawing 25 and the mode is changed to it is shown. Although it will be shown in drawing 27 if a Redo function is performed by Architect A in the condition of this drawing 26 , the actuation at this time is explained using the flow chart shown in drawing 28 .

[0071] In the condition which showed in drawing 26 , although actuation when Architect A performs a Redo function is equivalent to revival directions of "creation of element 2" actuation in this example based on drawing 30 , this actuation is understood by the Redo functional activation section 15, and is transmitted to a database server 20 through a network 1. An architect name (=A) and an actuation name (=Redo) are included in the content of actuation transmitted. although the hysteresis DB Management Department 24 is first made into the invalid with activation of a Redo function among the trains of the operator criteria hysteresis object which the operator criteria hysteresis management object 50 to Architect A manages, it acquires the operator criteria hysteresis object 55 located in a head (step 141). In addition, this operator criteria hysteresis object 55 can be easily obtained also from the location of the effective hysteresis pointer shown by the arrow head 72. And the effective flag of the operator criteria hysteresis object 55 is changed effectively (step 142). Then, it is made to move so that the operator criteria hysteresis object 55 which confirmed the effective hysteresis pointer may be pointed out (step 143). And while changing effectively the effective flag of the model criteria hysteresis object 45 related with the operator criteria hysteresis object 55, the effective hysteresis pointer of the model criteria hysteresis management object 40 to an element 2 is moved so that the model criteria hysteresis object 45 may be pointed out (step 144,145). Although the configuration data object about an element 2 is revived

effectively here (step 146), since it is the same as step 135 of drawing 24 about this processing, explanation is omitted. Furthermore, the hysteresis DB Management Department 24 changes effectively the effective flag of the time amount shaft-basis hysteresis object 35 related with the operator criteria hysteresis object 55 through the model criteria hysteresis object 45 (step 147).
[0072] According to the gestalt of this operation, it can do in this way and the Redo function for every architect can be realized.
[0073] In addition, when performing a design in a team format, the case where the same element is designed by two or more architects can be considered. For example, as shown in drawing 29 , suppose that the same element 1 was made applicable to actuation by the both sides of Architect A and Architect B. In the condition by which it was shown in drawing 29 , if Architect B is going to perform a Undo function and cancel "correction of element 1" actuation, the CAD system in the gestalt of this operation will discover that "deletion of element 1" actuation by Architect A must also be canceled. In such a case, the following solutions can be considered.
[0074] How to give advice that it cannot perform by existence of actuation of Architect A to Architect B in the first place, and consider as an activation error can be considered. Since the Undo function was performed by Architect B to Architect A the second, how to notify the purport whether I may cancel "deletion of element 1" actuation, and make it choosing about the propriety of cancellation of actuation can be considered. The mode in which unconditionally third inconvenient actuation is canceled is formed, and how to cancel compulsorily "deletion of element 1" actuation by Architect A can be considered. In the situation shown in drawing 29 , it can be coped with by the approach of arbitration also including the these-illustrated approach or the other approaches.
[0075] By the way, it is easily applicable also to various employment by building the hysteresis DB23 shown in the gestalt of this operation. For example, although actuation was canceled by every one activation of the Undo function by manual operation by the above-mentioned explanation, it is also possible to specify time to return and to cancel actuation to there automatically.
[0076] Moreover, although the object for a design of 1 was divided into two or more parts, the case where at least each part constituted with two or more elements was further designed in a team format was written for the example and a common configuration database (part DB21) and hysteresis DB23 were established for every part with the gestalt of this operation Also in a design in the team format in the level of the low order which carried out the fragmentation rate further, it is [in / the whole object for a design like moreover] applicable. Or if the part information which shows which part it is data belonging to is added and managed to a configuration data object and hysteresis information even if it does not divide the object for a design of 1 into two or more parts, even when forming a team for every part, a common database can be given in the whole object for a design.
[0077] Moreover, in the gestalt of this operation, although explained by of two persons' of Architects' A and B case, it cannot be overemphasized that it can carry out even if it is three or more persons.
[0078] Furthermore, although he is trying to form an object with the gestalt of this operation, it is also possible to build the CAD system which starts this invention by technique other than an object-oriented technique.
[0079]
[Effect of the Invention] According to the gestalt of this operation, when a certain architect performs an undoing function, only actuation just before the architect concerned did can be canceled, without canceling actuation by other architects in the same team.
[0080] Moreover, when a certain architect performs a redo function, the architect concerned can revive only the actuation which performed and canceled the undoing function immediately before, without reviving the actuation which other architects in the same team canceled.
[0081] Moreover, not only activation of the undoing function for every architect and a redo function but this function on the basis of the same time-axis as usual can be performed selectively.

[Translation done.]

* NOTICES *

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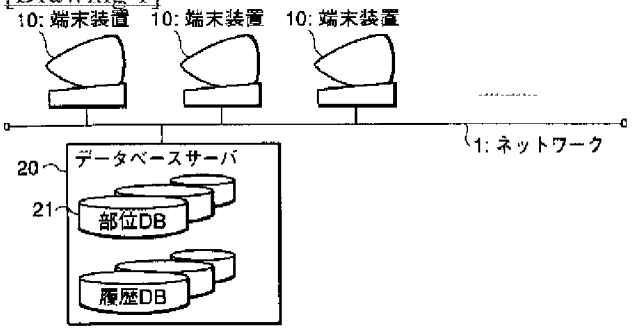
damages caused by the use of this translation.

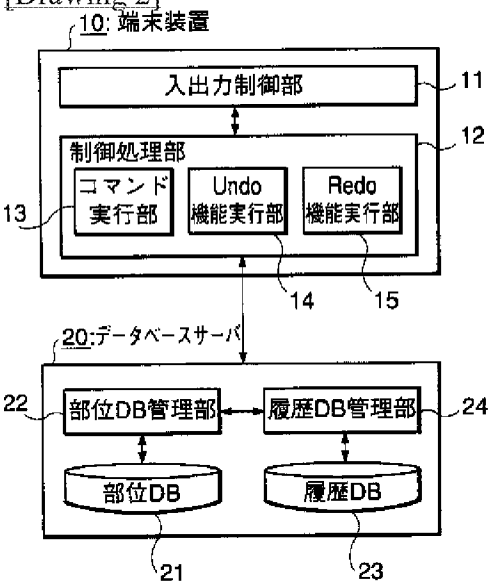
1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DRAWINGS

[Drawing 1]



[Drawing 2]



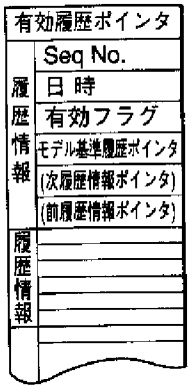
[Drawing 3]

履歴データベースの基本的なデータ構成例

日時	対象	操作	設計者	有効フラグ
T1	要素1	作成	A	有効
⋮	⋮	⋮	⋮	⋮

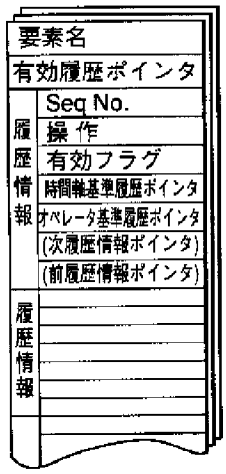
[Drawing 4]

時間軸基準履歴管理テーブル



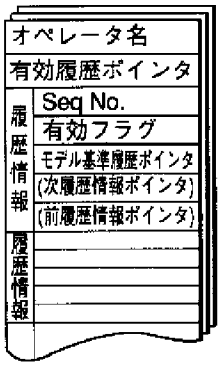
[Drawing 5]

モデル基準履歴管理テーブル



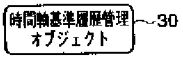
[Drawing 6]

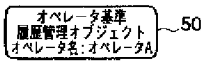
オペレータ基準履歴管理テーブル

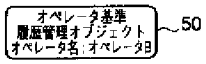


[Drawing 7]

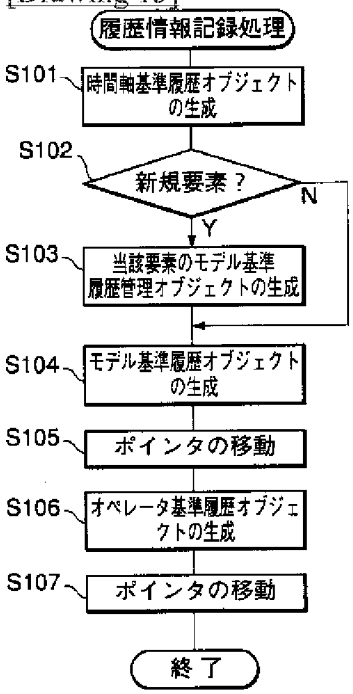
設計開始前



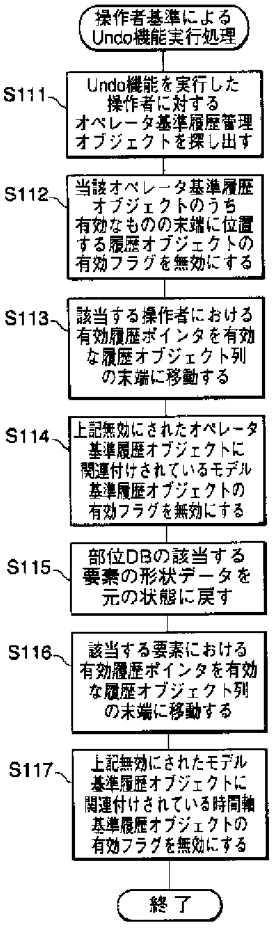




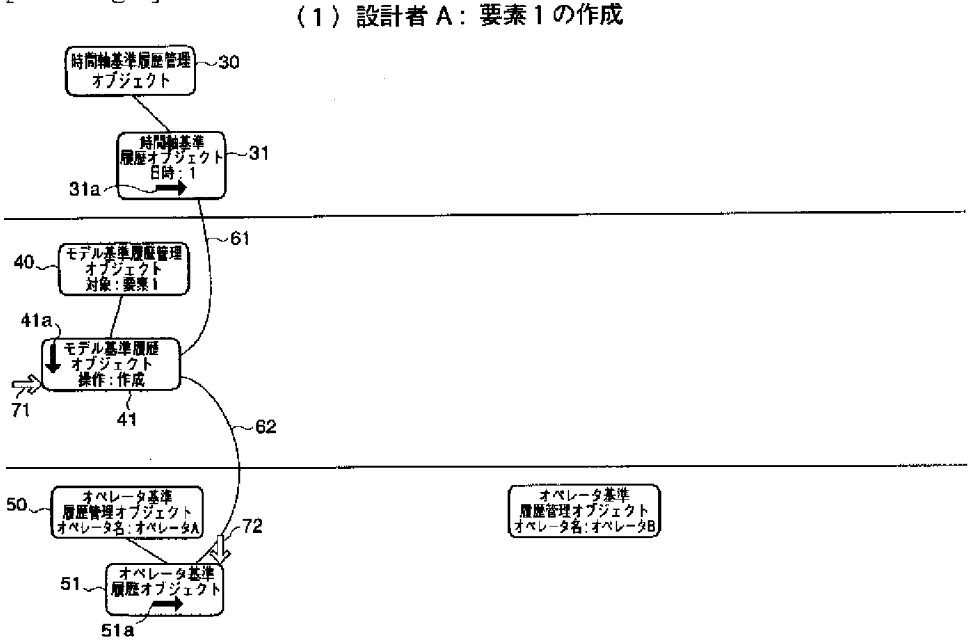
[Drawing 15]



[Drawing 20]

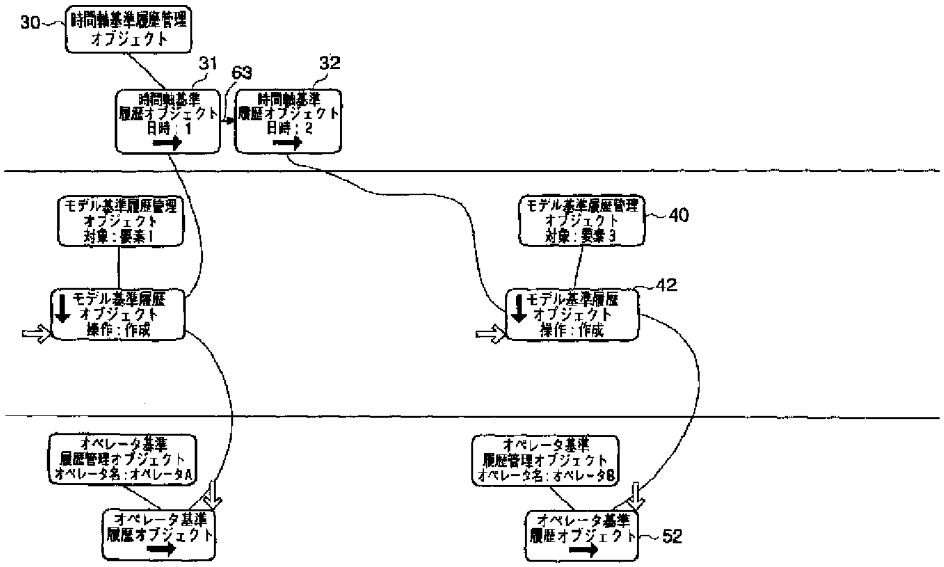


[Drawing 8]

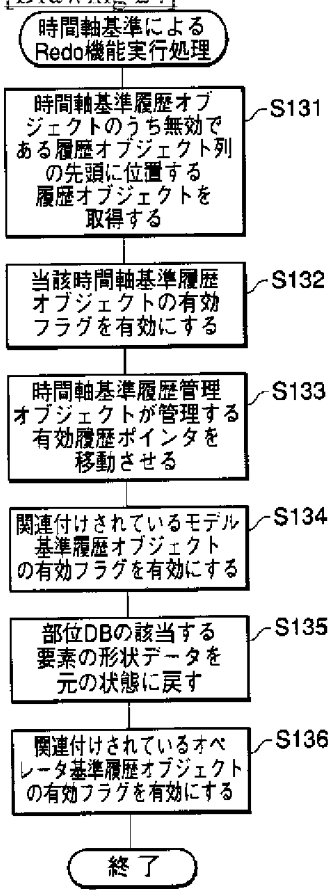


[Drawing 9]

（2）設計者 B：要素 3 の作成

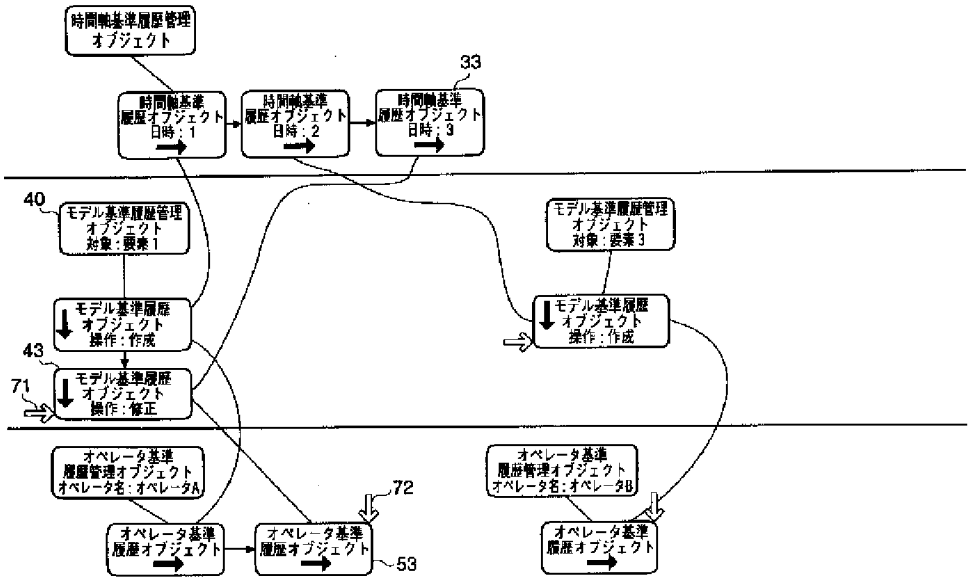


[Drawing 24]



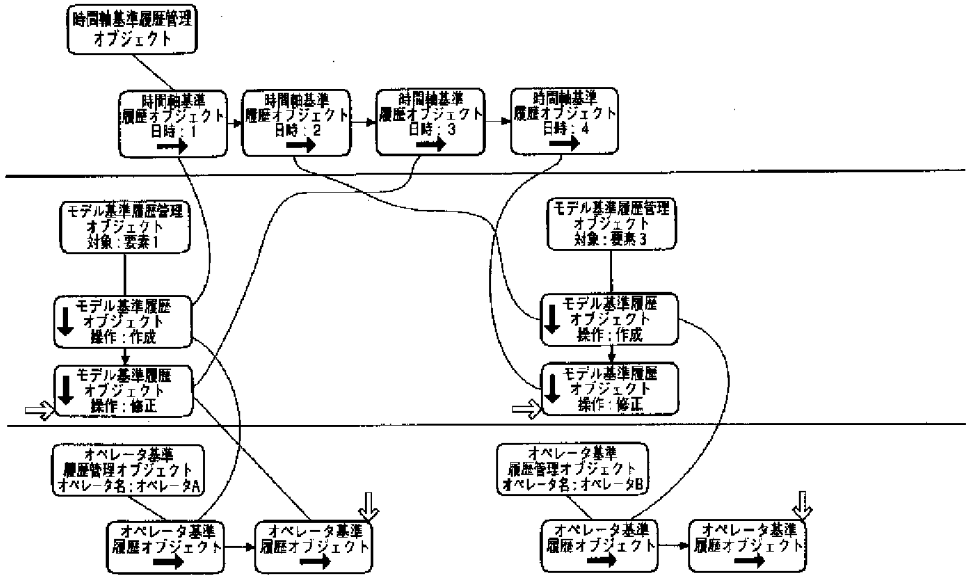
[Drawing 10]

（３）設計者Ａ：要素１の修正

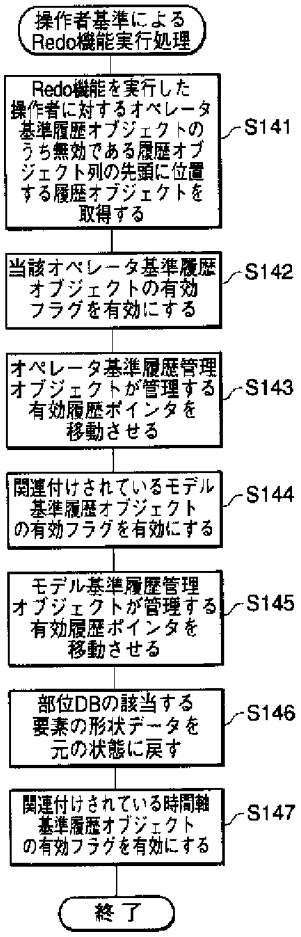


[Drawing 11]

（４）設計者Ｂ：要素３の修正



[Drawing 28]



[Drawing 30]

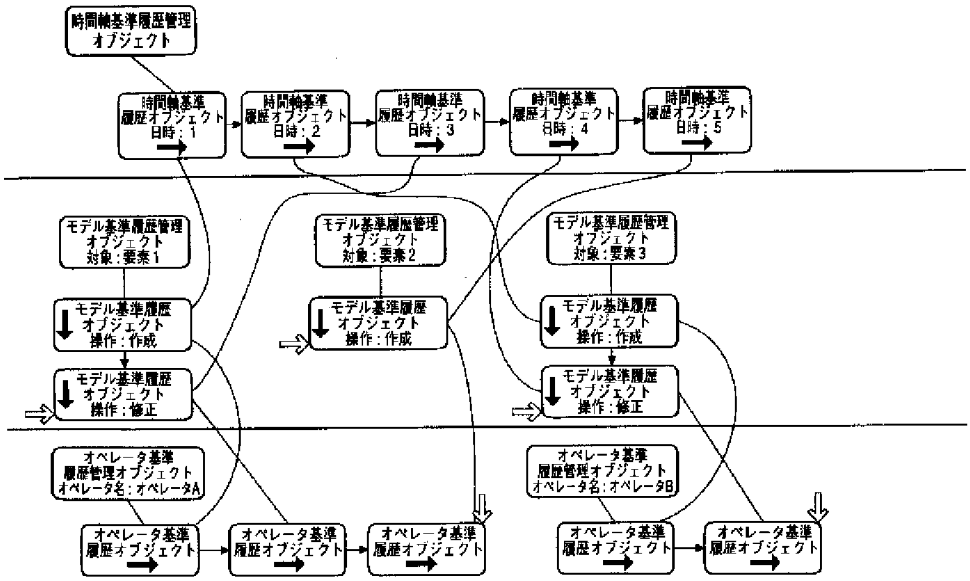
設計者	操作の内容
A	要素１の作成
B	要素３の作成
A	要素１の修正
B	要素３の修正
A	要素２の作成
B	要素４の作成
A	要素２の削除

[Drawing 31]

日時	対象	操作
T1	要素１	作成
T2	要素３	作成
T3	要素１	修正
T4	要素３	修正
T5	要素２	作成
T6	要素４	作成
T7	要素２	削除

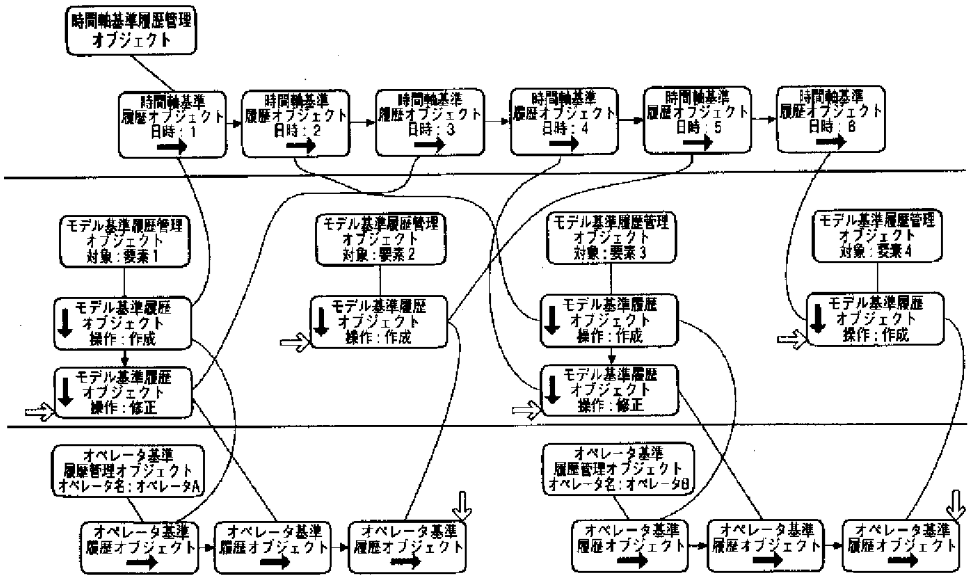
[Drawing 12]

（５）設計者Ａ：要素２の作成



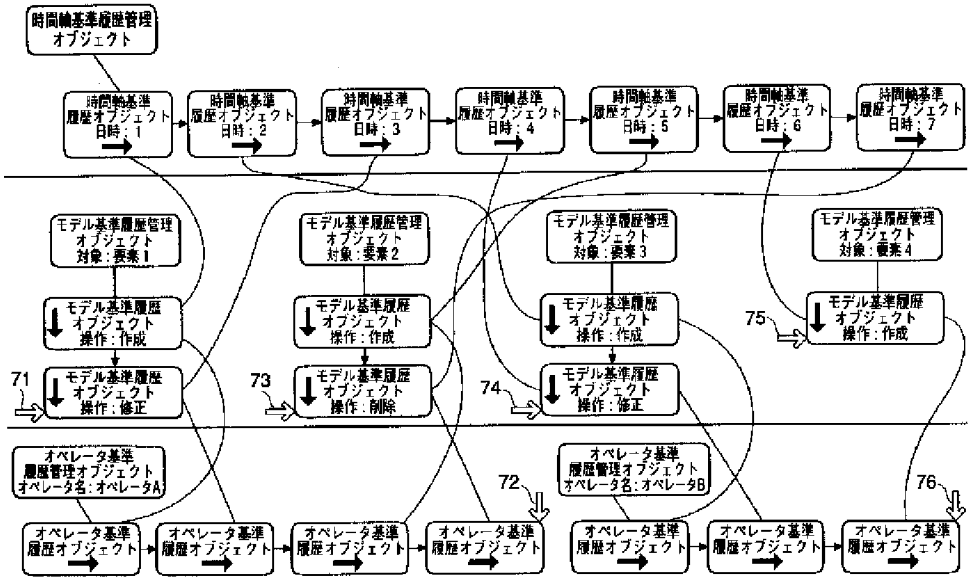
[Drawing 13]

（６）設計者Ｂ：要素４の作成



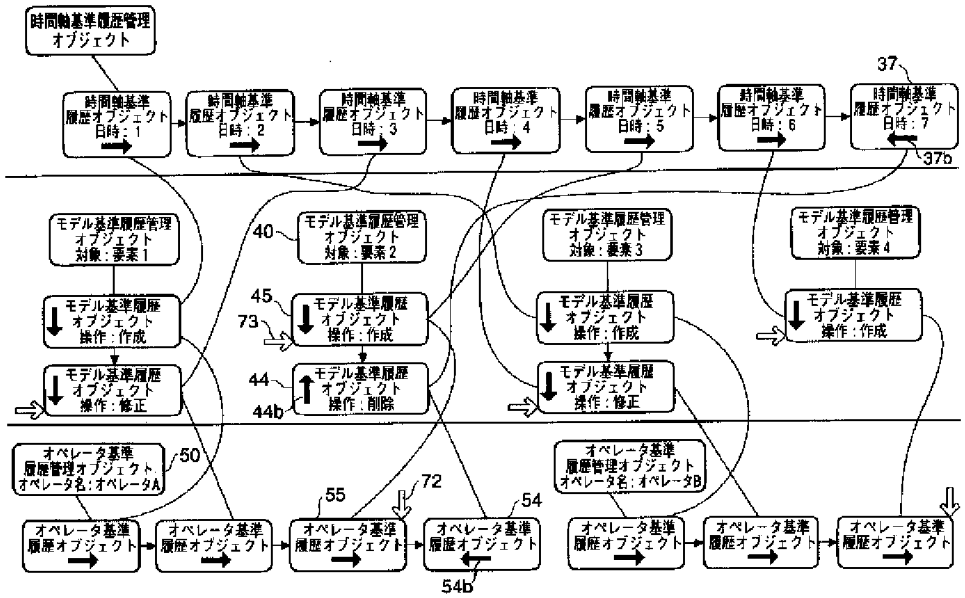
[Drawing 14]

（７）設計者Ａ：要素２の削除



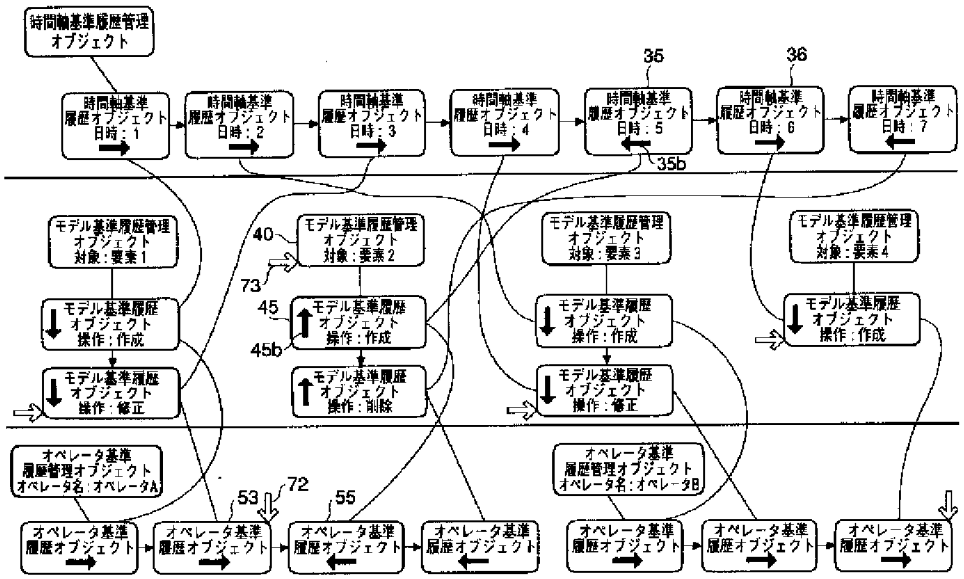
[Drawing 16]

（１）設計者 AによるUndo機能の実行



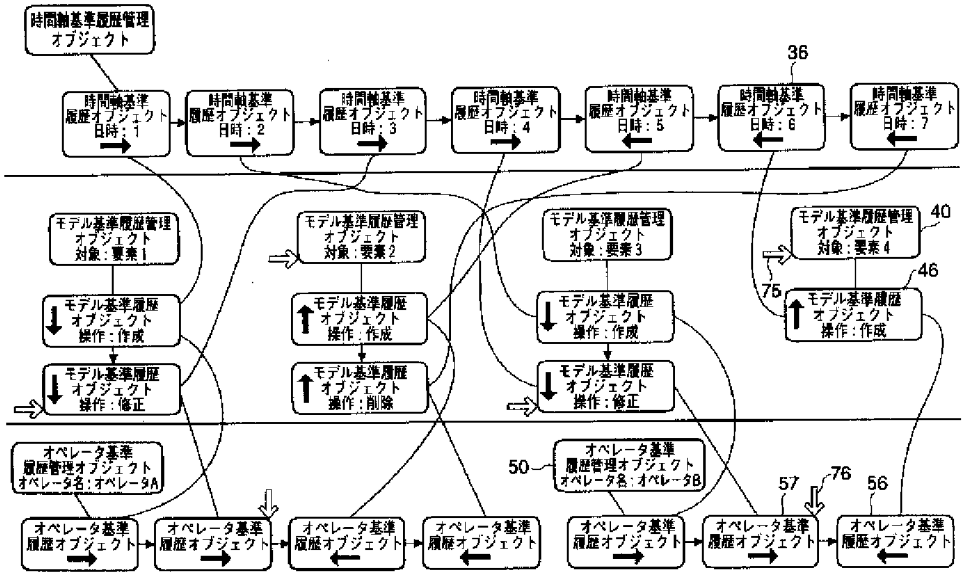
[Drawing 17]

（２）設計者 AによるUndo機能の実行



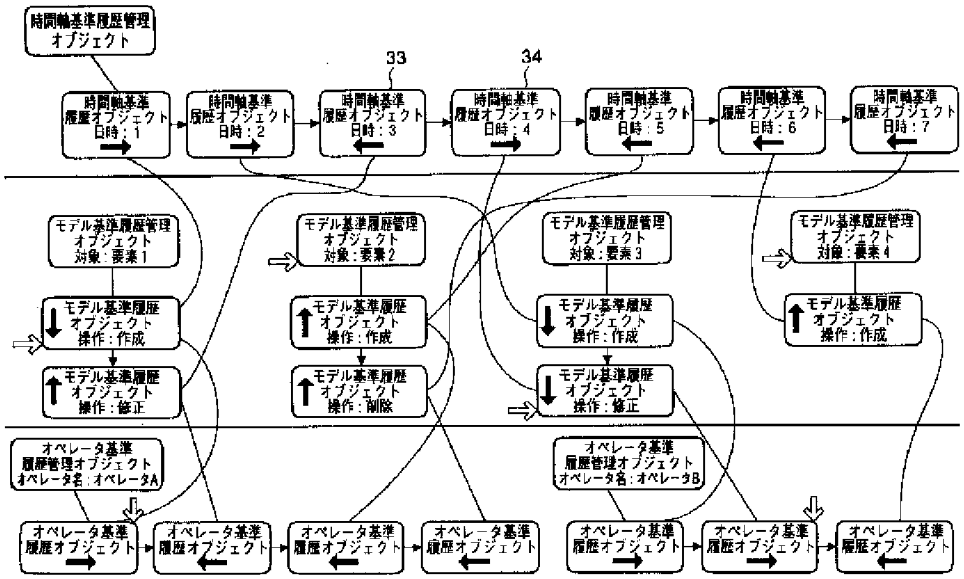
[Drawing 18]

（３）設計者 BによるUndo機能の実行



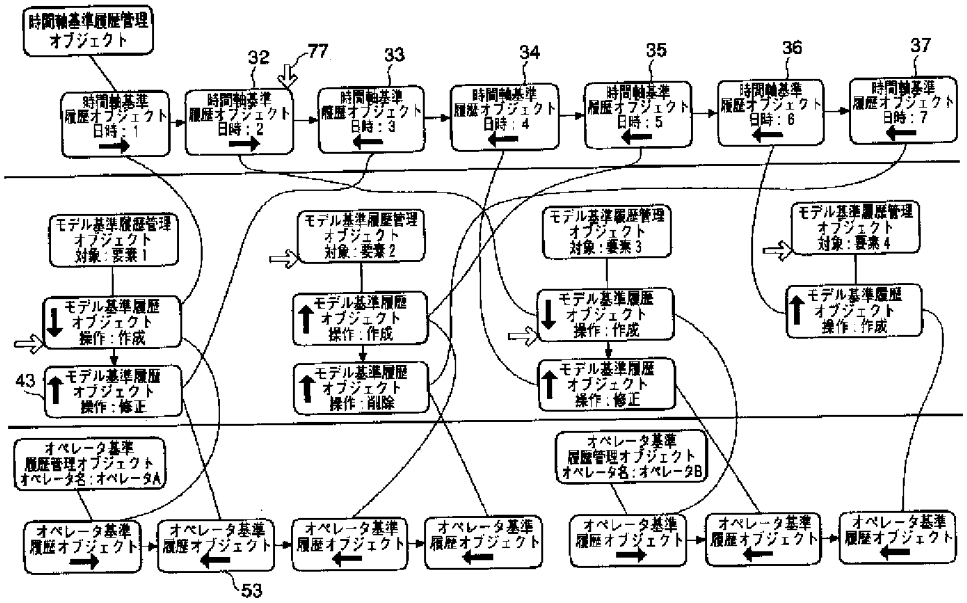
[Drawing 19]

（４）設計者 AによるUndo機能の実行

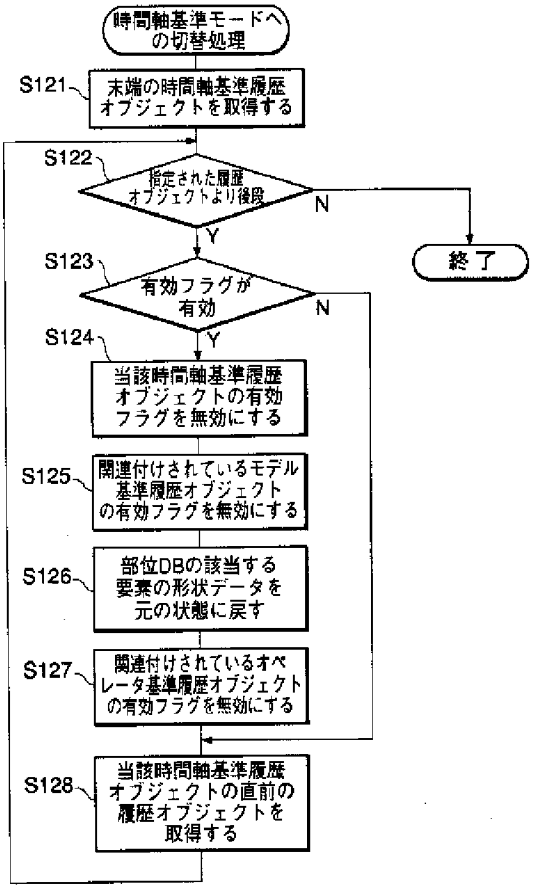


[Drawing 21]

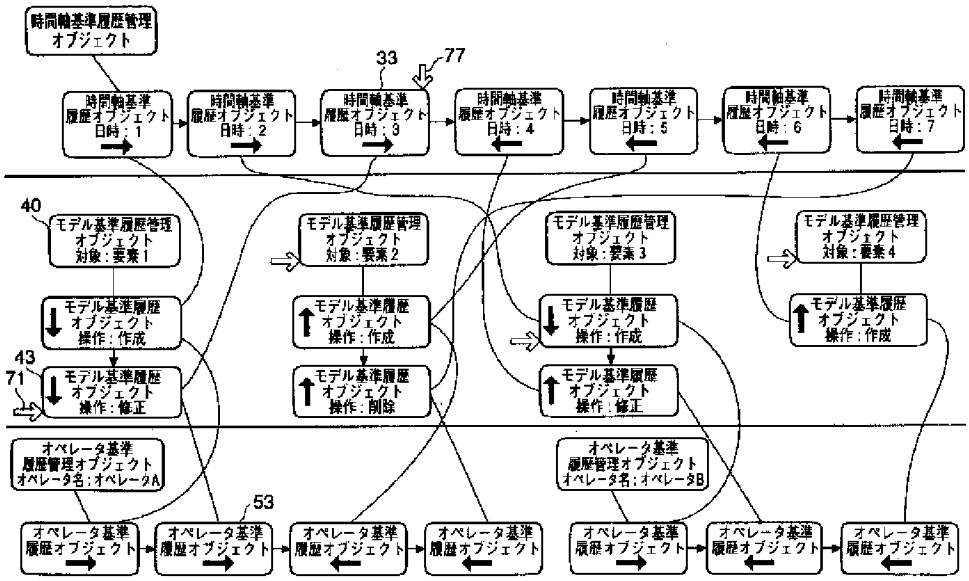
時間軸基準モードに切り替え



[Drawing 22]

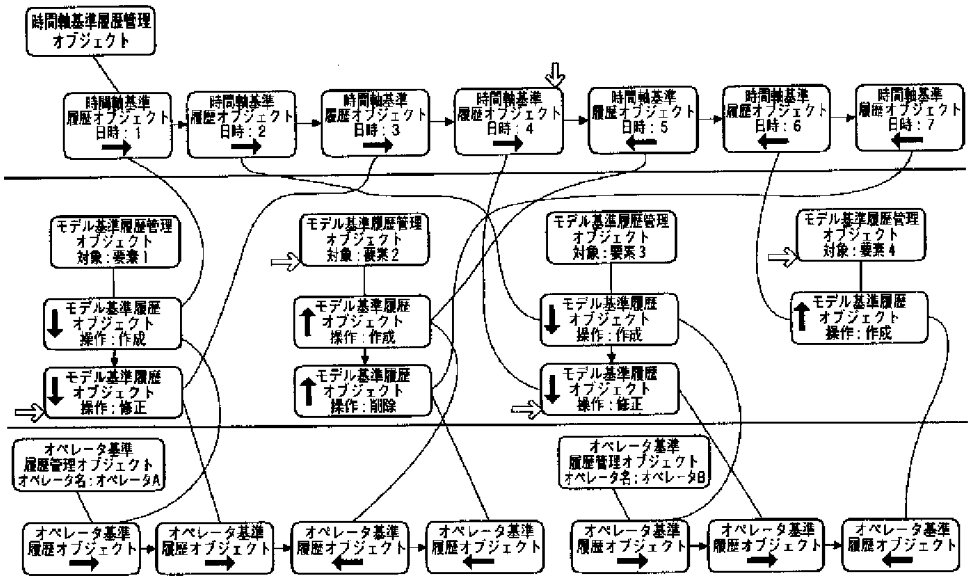


[Drawing 23]



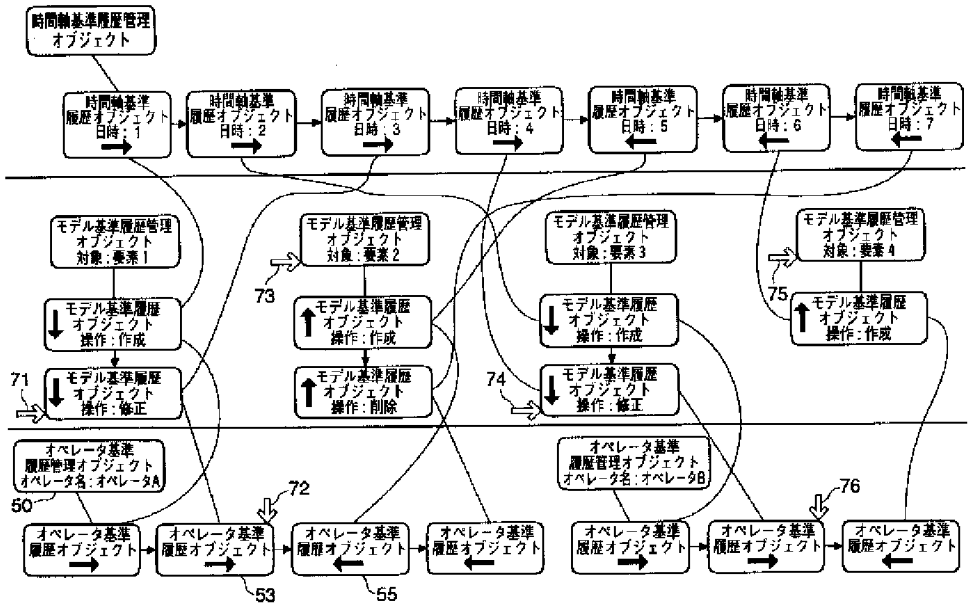
[Drawing 25]

（２）時間軸基準によるRedo機能の実行



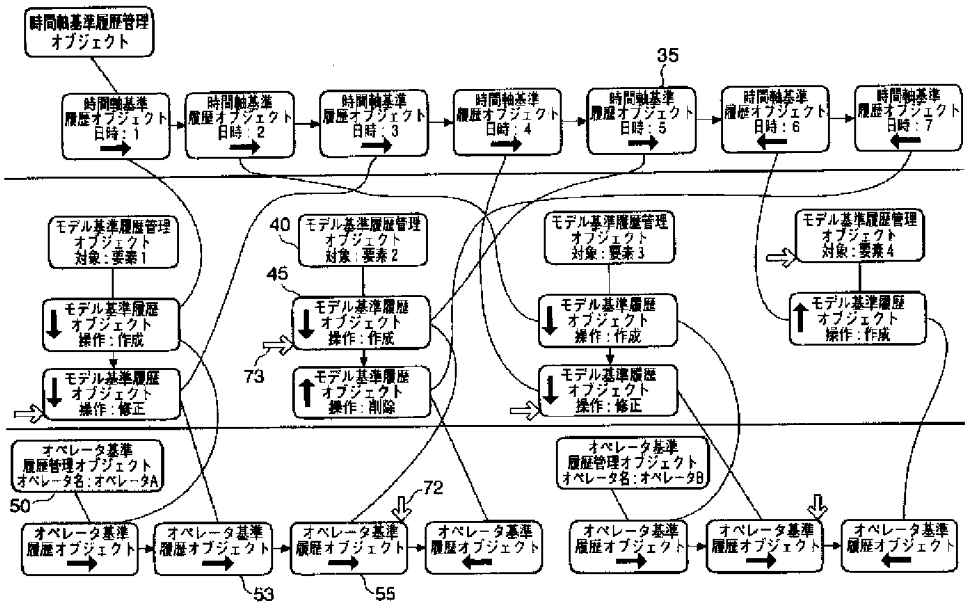
[Drawing 26]

操作者基準モードに切り替え



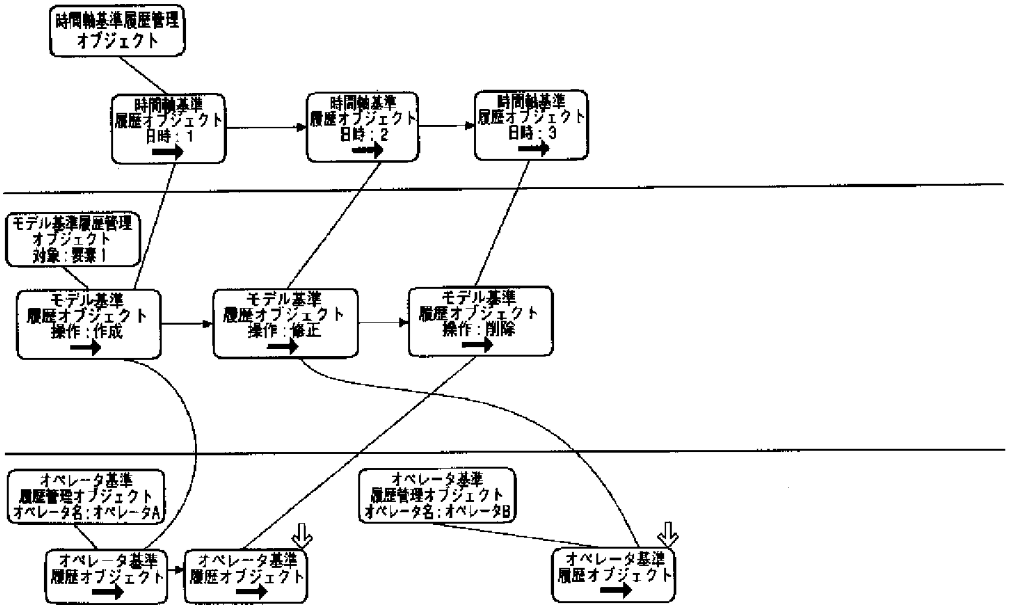
[Drawing 27]

設計者 AによるRedo機能の実行



[Drawing 29]

2人の設計者の操作が干渉している例



[Translation done.]

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2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

EFFECT OF THE INVENTION

[Effect of the Invention] According to the gestalt of this operation, when a certain architect performs an undoing function, only actuation just before the architect concerned did can be canceled, without canceling actuation by other architects in the same team.
[0080] Moreover, when a certain architect performs a redo function, the architect concerned can revive only the actuation which performed and canceled the undoing function immediately before, without reviving the actuation which other architects in the same team canceled.
[0081] Moreover, not only activation of the undoing function for every architect and a redo function but this function on the basis of the same time-axis as usual can be performed selectively.

[Translation done.]

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MEANS

[Means for Solving the Problem] In order to attain the above objects, the CAD system for a team formal design concerning this invention While carrying out sequential record of the content of each actuation which each architect performs in the design which two or more architects do in a team format at a hysteresis information storage means common as hysteresis information In the CAD system which offers the undoing function for canceling the last actuation based on the order of record to said hysteresis information storage means of hysteresis information The hour entry to which the actuation was carried out whenever the architect operated it, the element contained in the object for a design set as the object of the actuation, A hysteresis information gathering means to record on said hysteresis information storage means with the information showing the effective invalid of the actuation set up in hysteresis information including the information about the architect who performed the classification and its actuation of the actuation as it is effective, It has an undoing functional control processing means to change into an invalid the information showing the effective invalid of the actuation corresponding to the hysteresis information on the actuation concerned currently recorded on said hysteresis information storage means while canceling the target actuation, when an undoing function is performed. Said undoing functional control processing means is characterized by canceling actuation just before the architect concerned carried out, when an architect performs an undoing function.
[0009] Moreover, said undoing functional control processing means is characterized by canceling either of the actuation just before following the time amount by which it was operated or operated just before the architect concerned carried out according to the mode selection by the architect, when an architect performs an undoing function.
[0010] Moreover, it has a redo functional control processing means to change effectively the information showing the effective invalid of the actuation corresponding to the hysteresis information on the actuation concerned currently recorded on said hysteresis information storage means while reviving the actuation canceled by activation of the last undoing function, when a redo function is performed. When an architect performs a redo function, it is characterized by the architect concerned reviving the actuation canceled by activation of the last undoing function by searching said hysteresis information storage means.
[0011] Moreover, said redo functional control processing means carries out [reviving either of the actuation canceled by activation of an undoing function immediately before according to the time amount by which the actuation or the undoing function canceled by activation of the undoing function of the architect concerned according to the mode selection by the architect was performed, and] as the description, when an architect performs a redo function.
[0012] Furthermore, said hysteresis information gathering means is characterized by classifying the hysteresis information about one actuation a time-axis criteria and element exception and according to an architect, and managing it.
[0013] According to this invention, actuation just before the architect who performed the undoing function out of the actuation which the architect belonging to a team performed carried out can be searched, and the actuation can be canceled.

[0014] Moreover, the architect who performed the redo function similarly can revive the actuation canceled by activation of the last undoing function.
[0015]
[Embodiment of the Invention] Hereafter, the gestalt of suitable operation of this invention is explained based on a drawing.
[0016] Drawing 1 is the block block diagram having shown the gestalt of 1 operation of the CAD system concerning this invention. The terminal unit 10 which each architect connected by the network 1 uses for drawing 1 , and the database server 20 which manages the various databases shared by the architect are shown.
[0017] Drawing 2 is the block block diagram of the each terminal unit 10 and database server 20 which were shown in drawing 1 . The terminal unit 10 has I/O control unit 11 which controls various input/output equipment which is not illustrated, such as a mouse and a display, and the control processing section 12 which performs control of others in a terminal unit 10 at large. The command execution section 13 which executes the CAD command directed to the architect, the undoing functional activation section 14 which performs an undoing function, and the redo functional activation section 15 which performs a redo function are contained in the control processing section 12. The application which can realize a terminal unit 10 at a CAD terminal general-purpose in hard, and is performed on equipment differs from the former. The gestalt of this operation has realized by application objects, such as an object for a display on the configuration data object which expresses the configuration data of each element, such as a line and a circle, for this, and the display screen showing an element.
[0018] on the other hand -- a database server -- 20 -- a design -- an object -- a configuration -- being related -- data -- storing -- a database -- managing -- although -- a book -- operation -- a gestalt -- **** -- a design -- an object -- a part -- every -- a team -- a format -- designing -- making -- **** -- since -- a configuration -- a database -- ****** -- preparing -- having -- **** -- a part -- a database -- (-- DB --) -- 21 -- managing -- **** . A part DB21 is an object oriented database, and stores a part or the configuration data object of components. The part database (DB) Management Department 22 performs an update process of a part DB21 etc. based on the configuration data object with which generation, deletion, etc. are carried out by activation of the CAD command. Furthermore, the part DB Management Department 22 directs record of hysteresis information to the hysteresis database (DB) Management Department 24 with registration of a configuration data object etc. The hysteresis DB Management Department 24 is a hysteresis information gathering means to collect the hysteresis of the actuation which an architect performs in a design, and to record on the hysteresis database (DB) 23 serially. Moreover, the hysteresis DB Management Department 24 constitutes an undoing functional control processing means to change with an invalid the information showing the effective invalid of the actuation corresponding to the hysteresis information on the actuation concerned currently recorded on hysteresis DB23, with the undoing functional activation section 14 while canceling the target actuation, when an undoing function is performed. Furthermore, when a redo function is performed, while reviving the actuation canceled by activation of the last undoing function, a redo functional control processing means change the information showing the effective invalid of the actuation corresponding to the hysteresis information on the actuation concerned currently recorded on hysteresis DB23 as it is effective is constituted with the redo functional activation section 15.
[0019] Drawing 3 is drawing having shown the fundamental example of a data configuration of the hysteresis DB23 in the gestalt of this operation. The information about the actuation whenever an architect operates it is accumulated in hysteresis DB23 as hysteresis information. The information showing the architect who performed classification of the actuation, such as a hour entry to which the actuation was carried out, an element contained in the object for a design set as the object of the actuation, creation, and correction, and its actuation, and the effective invalid of the actuation is included in each hysteresis information, and it is expressed with "time", an "object", "actuation", an "architect", and an "effective flag" in drawing 3 , respectively When the content of actuation revives by activation of the time of being recorded newly, or a redo function, it becomes effective and "validity" is canceled by activation of an undoing function, an "invalid" is set to an effective flag. In addition, although the flag

information of an "effective flag" expressed the effective invalid of the content of actuation with the gestalt of this operation, it is also possible to make it express with other expression methods, for example, pointer information.

[0020] It being characteristic in the gestalt of this operation is having enabled it to perform an undoing function and a redo function for every architect by having given the information about an architect to hysteresis information. For example, when actuation is carried out in the procedure shown in drawing 30 and Architect B wants to cancel "creation of element 4" actuation, Architect B can cancel only "creation of element 4" actuation which self carried out, without canceling "deletion of element 2" actuation which Architect A did by performing a Undo function once.

[0021] By the way, with the gestalt of this operation, coexistence with the so-called Undo function of time-axis criteria and the Redo function in which the operated same time amount as usual was met, and the Undo function of an architect unit and Redo function which are the description of the gestalt of this operation and which were operated is enabled. moreover -- since the object has realized each function in the gestalt of this operation -- more -- operation -- since it is easy, hysteresis DB23 has been realized by different DS from having been actually shown in drawing 3 . The DS of the hysteresis DB23 used in the gestalt of this the operation of this is explained.

[0022] In the gestalt of this operation, hysteresis information was divided into three criteria and managed. One is the hysteresis information on the basis of a time-axis, and it shows this to drawing 4 in the table format of a time amount shaft-basis hysteresis managed table. One is the hysteresis information on the basis of the element made applicable to actuation, and it shows this to drawing 5 in the table format of a model criteria hysteresis managed table. Remaining one is the hysteresis information on the basis of the architect who operated it, and it shows this to drawing 6 in the table format of an operator criteria hysteresis managed table. Although expressed with drawing 4 thru/or drawing 6 in the table format for convenience, each hysteresis information is formed by one object. Whenever an architect operates it, hysteresis information will be related with each table, respectively, and it will be recorded.

[0023] first, to the hysteresis information on a time amount shaft-basis hysteresis managed table "SeqNo." which shows the order of record, the "time" which shows the time of day when actuation was carried out, The "effective flag" showing the effective invalid of the actuation corresponding to the hysteresis information concerned as information, The "model criteria hysteresis pointer" for relating with the hysteresis information on the model criteria hysteresis managed table recorded corresponding to the hysteresis information concerned, The "before hysteresis information pointer" which cooperates the hysteresis information recorded immediately before on the "hysteresis [degree] information pointer" which cooperates the hysteresis information recorded immediately after on the time amount shaft-basis hysteresis managed table, and the time amount shaft-basis hysteresis managed table is contained. Each hysteresis information will be a fixed length, and a "hysteresis [degree] information pointer" and a "before hysteresis information pointer" will be unnecessary information if a time amount shaft-basis hysteresis managed table is formed in a continuation field. Moreover, as long as it can connect with the time order which had each hysteresis information operated, you may realize by other approaches. Moreover, since the once recorded hysteresis information was not eliminated even if it was canceled by the Undo function in principle, it formed the "effective hysteresis pointer" so that it could grasp easily which actuation is effective, even if it did not check an "effective flag." That is, an effective hysteresis pointer points out the hysteresis information located in an end among effective hysteresis information trains. If there is even either information of an "effective hysteresis pointer" and an "effective flag", it is possible to operate this system normally, but with the gestalt of this operation, in order to attain speeding up of processing, both sides are prepared. If "Seq No." of hysteresis information is set to an "effective hysteresis pointer", the end of effective actuation can be shown easily. Whenever actuation is performed, hysteresis information is accumulated in the time amount shaft-basis hysteresis managed table. In this hysteresis information, the information (this example "model criteria hysteresis pointer") for carrying out correlation with a hour entry (this example "time") and the hysteresis information on other tables is indispensable data.

[0024] The table having shown in the model criteria hysteresis managed table for every element at

drawing 5 is generated. The "operator criteria hysteresis pointer" for relating with the hysteresis information on the "time-amount shaft-basis hysteresis pointer" for relating with the hysteresis information on the time-amount shaft-basis hysteresis managed table recorded corresponding to "actuation" which shows the classification of actuation, such as creation and correction, and the hysteresis information concerned, and the operator criteria hysteresis managed table which were recorded corresponding to the hysteresis information concerned is contained in the hysteresis information here. Since the hysteresis information on other "Seq No.", an "effective flag", a "hysteresis [degree] information pointer", and a "before hysteresis information pointer" and an "effective hysteresis pointer" are the same as that of a time amount shaft-basis hysteresis managed table, explanation is omitted. in a model criteria hysteresis managed table, the information (this example -- a "time amount shaft-basis hysteresis pointer" and an "operator criteria hysteresis pointer") for carrying out correlation with the "element name" equivalent to the "object" of drawing 3 and the hysteresis information on other tables is indispensable data.

[0025] The table having shown in the operator criteria hysteresis managed table for every architect at drawing 6 is generated. Although "Seq No.", the "effective flag", the "model criteria hysteresis pointer", the "hysteresis [degree] information pointer", and the "before hysteresis information pointer" are contained in the hysteresis information here, since each information is the same as that of each above-mentioned table, explanation is omitted. In an operator criteria hysteresis managed table, the information (this example "model criteria hysteresis pointer") for carrying out correlation with the "operator name" equivalent to the "architect" of drawing 3 and the hysteresis information on other tables is indispensable data. In addition, although it can relate with the hysteresis information on a time amount shaft-basis hysteresis managed table indirectly through the hysteresis information on a model criteria hysteresis managed table, a "time amount shaft-basis hysteresis pointer" may be directly included in hysteresis information.

[0026] Next, although the actuation in the gestalt of this operation is explained, hysteresis information is recorded on hysteresis DB23, and by performing actuation in the procedure shown in drawing 30 explains the case where a Undo function and a Redo function are performed after that here, using drawing after drawing 7 which showed typically the content of the object shown in the table format in drawing 4 thru/or drawing 6 . Moreover, in the gestalt of this operation, the team shall be formed in Architects (operator) A and B.

[0027] First, in Architects A and B, before a design is started, the part DB21 and hysteresis DB23 which are shared between the team are prepared. In addition, the time amount shaft-basis hysteresis management object 30 in drawing 7 is equivalent to the "effective hysteresis pointer" of the time amount shaft-basis hysteresis managed table shown in drawing 4 at "operator name" + "an effective hysteresis pointer", respectively. [of the operator criteria hysteresis managed table having shown each architect's operator criteria hysteresis management object 50 at drawing 6] Moreover, the model criteria hysteresis management object 40 explained later on will be equivalent to "element name" + "an effective hysteresis pointer". [of the model criteria hysteresis managed table shown in drawing 5]

[0028] Record **** to the hysteresis DB of hysteresis information and hysteresis information explain to drawing 8 thru/or drawing 14 the actuation recorded on hysteresis DB23 using the flow chart shown in the transition diagram and drawing 15 of the hysteresis information shown typically.

[0029] The configuration data object with which the command execution section 13 understood "creation of element 1" actuation by Architect A, and was generated is transmitted to a database server 20 through a network 1. The part DB Management Department 22 registers the sent configuration data object into a part DB21. Furthermore, the hysteresis DB Management Department 24 is notified of the registered purport with the information about the actuation "Architect A created the element 1." The hysteresis DB Management Department 24 records hysteresis information on hysteresis DB23 based on the content of the received advice. That is, as shown in drawing 8 , the time amount shaft-basis hysteresis object 31, the model criteria hysteresis object 41, and the operator criteria hysteresis object 51 equivalent to each hysteresis information on three kinds of tables mentioned above are generated (step 101,104,106).

[0030] First, in step 101, although "validity" is set up and generated by the time of day and the "effective flag" which were operated by the "time" at the time amount shaft-basis hysteresis object 31, in the gestalt of this operation, the information on time will be shown in order of the record which is only equivalent to "Seq No." Moreover, an "effective flag" will express an "effective" purport with arrow-head 31a of the right sense. Thus, the generated time amount shaft-basis hysteresis object 31 is managed by the time amount shaft-basis hysteresis management object 30.
[0031] Next, when the element used as a processing object is new, the hysteresis DB Management Department 24 generates the model criteria hysteresis management object 40 to the element concerned inside with the advice, and makes actuation start (step 102,103). In the case of this example, the model criteria hysteresis management object 40 to an element 1 is generated inside. In step 104, although "validity" is set as the "actuation" by "creation" and an "effective flag" at the model criteria hysteresis object 41, in the gestalt of this operation, an "effective flag" will express an "effective" purport with downward arrow-head 41a. And it connects with the model criteria hysteresis management object 40 to an element 1, and the end (here model criteria hysteresis object 41) of the object corresponding to effective actuation is further pointed out by the arrow head 71 in the train of the model criteria hysteresis object of an element 1 (step 105). This arrow head 71 is equivalent to the effective hysteresis pointer of a model criteria hysteresis managed table. Thus, the generated model criteria hysteresis object 41 is managed by the corresponding model criteria hysteresis management object 40.
[0032] In addition, when a Undo function is performed, it is necessary to return the element used as the object for actuation to the original condition. If it puts in another way, it is necessary to return a configuration data object to the condition in front of a certain actuation. Moreover, when a Redo function is performed, it is necessary to return further the element which returned to the original condition by activation of a Undo function. In order to make this possible, he relates with a model criteria hysteresis object the backup-status information about the element which became an object for actuation whenever the actuation to a certain element was made, and is trying to hold it with the gestalt of this operation, but about this processing, since it is not the summary of this invention, explanation is omitted.
[0033] In step 106, although "validity" is set as the "effective flag" by the operator criteria hysteresis object 51, in the gestalt of this operation, an "effective flag" will express an "effective" purport with arrow-head 51a of the right sense. The operator criteria hysteresis object 51 is connected with the operator criteria hysteresis management object 50 to Operator A, and points out the end (here operator criteria hysteresis object 51) of the object train corresponding to effective actuation by the arrow head 72 in the train of Operator's A operator criteria hysteresis object further (step 107). This arrow head 72 is equivalent to the effective hysteresis pointer of an operator criteria hysteresis managed table. And each newly recorded hysteresis objects 31, 41, and 51 are associated with a time amount shaft-basis hysteresis pointer, a model criteria hysteresis pointer, and an operator criteria hysteresis pointer as they explained each above-mentioned table using drawing 4 thru/or drawing 6 . This associated situation is expressed with lines 61 and 62 at drawing 8 .
[0034] Next, the configuration data object with which the command execution section 13 understood "creation of element 3" actuation by Architect B, and was generated is transmitted to a database server 20 through a network 1. The part DB Management Department 22 registers the sent configuration data object into a part DB21. Furthermore, the hysteresis DB Management Department 24 is notified of the registered purport with the information about the actuation "Architect B created the element 3." The hysteresis DB Management Department 24 records hysteresis information on hysteresis DB23 based on the received content of advice. That is, as shown in drawing 9 , the time amount shaft-basis hysteresis object 32, the model criteria hysteresis object 42, and the operator criteria hysteresis object 52 equivalent to each hysteresis information on three kinds of tables mentioned above are generated (step 101,104,106). The content is set up by the same processing as the above.
[0035] First, the time amount shaft-basis hysteresis object 32 generated in step 101 is connected immediately after the time amount shaft-basis hysteresis object 31 already recorded. The information equivalent to the hysteresis [degree (before)] information pointer of a time amount shaft-basis

hysteresis managed table is expressed with a line 63. In addition, the setting-out approach of the content of the time amount shaft-basis hysteresis object 32 is the same as the above.
[0036] Next, since the element 3 used as a processing object is new, the model criteria hysteresis management object 40 to an element 3 is generated inside, and actuation is made to start (step 102,103). In addition, the content of the model criteria hysteresis object 42 and the setting-out approach of an effective hysteresis pointer are the same as the above.
[0037] And it carries out like the time of "creation of element 1" actuation by the architect A who also mentioned above generation of the operator criteria hysteresis object 52 to Operator B (step 106,107).
[0038] Next, the configuration data object with which the command execution section 13 understood the "correction of element 1" actuation by Architect A, and was generated is transmitted to a database server 20 through a network 1. The part DB Management Department 22 registers the sent configuration data object into a part DB21. Furthermore, the part DB Management Department 22 notifies the hysteresis DB Management Department 24 of the registered purport with the information about the actuation "Architect A corrected the element 1." The hysteresis DB Management Department 24 records hysteresis information on hysteresis DB23 based on the content of advice. That is, as shown in drawing 10 , the time amount shaft-basis hysteresis object 33, the model criteria hysteresis object 43, and the operator criteria hysteresis object 53 equivalent to each hysteresis information on three kinds of tables mentioned above are generated (step 101,104,106). Each content of each hysteresis objects 33, 43, and 53 is set up like the above. Among these, "validity" is set as the time of day and the "effective flag" which were operated by the time amount shaft-basis hysteresis object 33 in the "time" (step 101). And it connects with the tail end of the hysteresis object which the time amount shaft-basis hysteresis management object 30 manages. "Validity" is set as the "actuation" by "correction" and an "effective flag" at the model criteria hysteresis object 43 (step 104). In addition, since the model criteria hysteresis management object 40 to an element 1 is generation ending, the arrow head 71 which the model criteria hysteresis object 43 is connected with the tail end of the hysteresis object which the model criteria hysteresis management object 40 to this element 1 manages, and is equivalent to an effective hysteresis pointer in connection with this is moved to this model criteria hysteresis object 43 (step 105). "Validity" is set as the "effective flag" by the operator criteria hysteresis object 53 (step 106). And the arrow head 72 which the operator criteria hysteresis object 53 is connected with the tail end of the hysteresis object which the operator criteria hysteresis management object 50 to Operator A manages, and is equivalent to an effective hysteresis pointer in connection with this is moved to this model criteria hysteresis object 53 (step 107). In addition, processing of correlation with the hysteresis information in front of others and the hysteresis information on other tables etc. is performed like the above.
[0039] Sequential record can be carried out at hysteresis DB23 by repeating the processing which also mentioned above the hysteresis information corresponding to each actuation from correction of the element 3 by the architect B who showed drawing 30 , and who mentions later to deletion of an element 2, and performing it. The condition that each hysteresis object was recorded by each subsequent actuation is shown in drawing 11 thru/or drawing 14 .
[0040] Although it is characterized by the gestalt of this operation enabling it to perform a Undo function for every architect as the Undo function carried out the activation (operator criteria mode) above-mentioned Next, the actuation in the gestalt of this operation when a Undo function is performed is explained to drawing 14 , drawing 16 , or drawing 19 using the flow chart shown in the transition diagram and drawing 20 of the hysteresis information shown typically from the condition which recorded hysteresis information as shown in drawing 14 . In addition, although the time-axis criteria mode performed according to the time amount operated like the Undo function and the former in the operator criteria mode in which a Undo function is performed per operator (architect) is offered with the gestalt of this operation, processing when operator criteria mode is chosen here is explained.
[0041] First, the hysteresis information currently recorded on the hysteresis DB23 before a Undo function is performed is in the condition shown in drawing 14 , and since the effective flag of all hysteresis objects is set up effectively, the arrow heads 71, 73, 74, and 75 of an effective hysteresis pointer have pointed out the end of the train of the model criteria hysteresis object in each elements 1-4.

Similarly, the arrow heads 72 and 76 of an effective hysteresis pointer have pointed out the end of the train of each operator criteria hysteresis object.
[0042] Suppose that Architect A performed the Undo function in this condition. This actuation is equivalent to cancellation directions of "deletion of element 2" actuation in this example based on drawing 30 . This actuation is understood by the Undo functional activation section 14, and is transmitted to a database server 20 through a network 1. An architect name (=A) and an actuation name (=Undo) are included in the content of actuation transmitted. The hysteresis DB Management Department 24 discovers the operator criteria hysteresis management object 50 to Architect A with activation of a Undo function (step 111), and an effective flag changes the effective flag of the operator criteria hysteresis object 54 of an "effective" end "invalid" among the trains of the operator criteria hysteresis object which the operator criteria hysteresis management object 50 concerned manages (step 112). The operator criteria hysteresis object 54 which corresponds since he is trying to point out the corresponding operator criteria hysteresis object 54 by the arrow head 72 of an effective hysteresis pointer can be immediately searched with the gestalt of this operation. In addition, in the gestalt of this operation, an "effective flag" will express an "invalid" purport with arrow-head 54b of the left sense. Then, it is located just before the operator criteria hysteresis object 54 which repealed the effective flag, and the arrow head 72 of an effective hysteresis pointer is moved to the operator criteria hysteresis object 55 whose effective flag is the end of an "effective" hysteresis information train (step 113). Next, the effective flag of the model criteria hysteresis object 44 connected from the model criteria hysteresis management object 40 to the element 2 in the hysteresis information, i.e., drawing 16 , of a model criteria hysteresis managed table associated by the model criteria hysteresis pointer of the hysteresis information (operator criteria hysteresis object 54) made into the invalid of an operator criteria hysteresis managed table is changed "invalid" (step 114). In addition, in the gestalt of this operation, an "effective flag" will express an "invalid" purport with upward arrow-head 44b.
[0043] the status information in front of the actuation activation to the element for Undo which relates with a model criteria hysteresis object and is held in hysteresis DB23 here -- using -- the part DB Management Department 22 -- leading -- a part DB21 -- as follows -- a case -- dividing -- carrying out -- changing (step 115) .
[0044] In Undo of "creation" actuation, a configuration data object will not exist. In addition, it leaves the configuration data object concerned as it is for future Redo functional activation. In Undo of "correction" actuation, the configuration data object which is in a part DB21 using the status information in front of the actuation activation to the backed up element for Undo is changed. In Undo of "deletion" actuation, the configuration data object which it left is re-registered into the set of an effective existing configuration data object. In this example, since it corresponds in Undo of "deletion" actuation, the configuration data object of the element 2 held at the time of "deletion" actuation is revived by re-registering with the set of an effective configuration data object.
[0045] Then, the hysteresis DB Management Department 24 is located just before the model criteria hysteresis object 44 which repealed the effective flag, and moves the arrow head 73 of an effective hysteresis pointer to the model criteria hysteresis object 45 whose effective flag is the end of an "effective" hysteresis information train (step 116). And the effective flag of the time amount shaft-basis hysteresis object 37 in the hysteresis information, i.e., drawing 16 , of a time amount shaft-basis hysteresis managed table associated by the time amount shaft-basis hysteresis pointer of a model criteria hysteresis managed table is changed "invalid" (step 117). In addition, in the gestalt of this operation, an "effective flag" will express an "invalid" purport with arrow-head 37b of the left sense.
[0046] As mentioned above, when a Undo function is performed, only processing which moves the processing and the effective hysteresis pointer which make an invalid the effective flag of the hysteresis object which corresponds to hysteresis DB23 is performed. In addition, since the processing mentioned above is processing at the time of the Undo functional activation in operator criteria mode, migration of the effective hysteresis pointer which the time amount shaft-basis hysteresis management object 30 manages is not indispensable processing.
[0047] Next, suppose that Architect A performed the Undo function continuously. This actuation is

equivalent to cancellation directions of "creation of element 2" actuation in this example based on drawing 30 . If this actuation is performed, the hysteresis DB Management Department 24 will be notified of the information "Architect A canceled "creation of element 2" actuation", and processing at the time of the following Undo functional activation will be performed.

[0048] First, an effective flag changes the effective flag of the operator criteria hysteresis object 55 of an "effective" end "invalid" among the trains of the operator criteria hysteresis object which the operator criteria hysteresis management object 50 to Architect A manages (step 111). Then, it is located just before the operator criteria hysteresis object 55 which repealed the effective flag, and the arrow head 72 of an effective hysteresis pointer is moved to the operator criteria hysteresis object 53 whose effective flag is the end of an "effective" hysteresis information train (step 112).

[0049] Next, the effective flag of the model criteria hysteresis object 45 connected from the model criteria hysteresis management object 40 to the element 2 in the hysteresis information, i.e., drawing 17 , of a model criteria hysteresis managed table associated by the model criteria hysteresis pointer of the hysteresis information (operator criteria hysteresis object 55) made into the invalid of an operator criteria hysteresis managed table is changed "invalid" (step 114). Then, an effective flag tends to move the arrow head 73 of an effective hysteresis pointer to the end of an "effective" hysteresis information train (step 116). Here, although the corresponding model criteria hysteresis object does not exist, in preparation for activation of a Redo function, the model criteria hysteresis management object 40 to an element 2 is pointed out. Of course, each model criteria hysteresis object is not eliminated in order to carry out record maintenance as hysteresis information. In addition, in subsequent explanation, an effective flag will express suitably the model criteria hysteresis object to which it is set as "validity/invalid" with an only effective / invalid model criteria hysteresis object.

[0050] Then, the effective flag of the time amount shaft-basis hysteresis object 35 in the hysteresis information, i.e., drawing 17 , of a time amount shaft-basis hysteresis managed table associated by the time amount shaft-basis hysteresis pointer of a model criteria hysteresis managed table is changed "invalid" (step 117).

[0051] According to the gestalt of this operation, "creation of element 4" actuation of Architect B which only the actuation which Architect A did by activation of the Undo function by Architect A was canceled, and was carried out after "creation of element 2" actuation by Architect A is still effective as it was shown in the time-amount shaft-basis hysteresis object 36 connected with the time-amount shaft-basis hysteresis management object 30.

[0052] Next, suppose that Architect B performed the Undo function. This actuation is equivalent to cancellation directions of "creation of element 4" actuation in this example based on drawing 30 . If this actuation is performed, the hysteresis DB Management Department 24 will be notified of the information "Architect B canceled "creation of element 4" actuation", and processing at the time of the following Undo functional activation will be performed.

[0053] First, an effective flag changes the effective flag of the operator criteria hysteresis object 56 of an "effective" end "invalid" among the trains of the operator criteria hysteresis object which the operator criteria hysteresis management object 50 to Architect B manages (step 112). The operator criteria hysteresis object 56 which corresponds since he is trying to point out the corresponding operator criteria hysteresis object 54 by the arrow head 76 of an effective hysteresis pointer can be immediately searched with the gestalt of this operation. Then, it is located just before the operator criteria hysteresis object 56 which repealed the effective flag, and the arrow head 76 of an effective hysteresis pointer is moved to the operator criteria hysteresis object 57 whose effective flag is the end of an "effective" hysteresis information train (step 113).

[0054] Next, the effective flag of the model criteria hysteresis object 46 connected from the model criteria hysteresis management object 40 to the element 4 in the hysteresis information, i.e., drawing 18 , of a model criteria hysteresis managed table associated by the model criteria hysteresis pointer of the hysteresis information (operator criteria hysteresis object 56) made into the invalid of an operator criteria hysteresis managed table is changed "invalid" (step 114). Then, an effective flag tends to move the arrow head 75 of an effective hysteresis pointer to the end of an "effective" hysteresis information

train (step 116). Here, although the corresponding model criteria hysteresis object does not exist, in preparation for activation of a Redo function, the model criteria hysteresis management object 40 to an element 4 is pointed out. Of course, each model criteria hysteresis object is not eliminated in order to carry out record maintenance as hysteresis information.

[0055] Then, the effective flag of the time amount shaft-basis hysteresis object 36 in the hysteresis information, i.e., drawing 18 , of a time amount shaft-basis hysteresis managed table associated by the time amount shaft-basis hysteresis pointer of a model criteria hysteresis managed table is changed "invalid" (step 117).

[0056] Thus, only actuation just before being based on Architect B can be canceled, without affecting the hysteresis information based on actuation of Architect A in any way also to activation of the Undo function by Architect B. Then, only "correction of element 1" actuation just before being based on Architect A can be canceled, without affecting the hysteresis information based on actuation of Architect B in any way, if the above-mentioned processing is followed even when Architect A performs a Undo function further and cancels "correction of element 1" actuation. The condition of the hysteresis information at this time is shown in drawing 19 .

[0057] Processing when activation (time-axis criteria mode) of a Undo function, next time-axis criteria mode are chosen is explained.

[0058] Although it will cancel in the Undo function in time-axis criteria mode sequentially from the actuation which set in the team according to the time amount operated not related according to an architect as usual, and was made into just before, since cancellation of actuation is performed without being restricted by the time-axis, in the operator criteria mode mentioned above, an effective time-axis criteria hysteresis object does not necessarily exist continuously. Specifically, the time amount shaft-basis hysteresis object 34 effective in the latter part of the invalid time amount shaft-basis hysteresis object 33 may exist as shown in drawing 19 . If possible, he wants to make this intermittence condition canceled since it cannot say that such a condition is desirable when performing the Undo function by the time-axis criteria mode in which the last actuation is canceled one by one. So, in a database server 20, processing in which the effective time amount shaft-basis hysteresis object which agreed on predetermined conditions at the time of a change in time amount shaft-basis mode is automatically made into an invalid is performed. This processing is explained to drawing 19 and drawing 21 using the flow chart shown in the transition diagram and drawing 22 of the hysteresis information shown typically.

[0059] When choosing time amount shaft-basis mode, it makes it specify which time amount shaft-basis hysteresis object to be automatically made into an invalid supposing the case where the effective time amount shaft-basis hysteresis object is not continuing. The control processing section 12 of each terminal unit 10 has the list of hysteresis information sent from the hysteresis DB Management Department 24, and an architect can be made to specify by displaying the list on a display. For example, the time amount shaft-basis hysteresis object 32 is made to specify in drawing 21 at the time of selection in time amount shaft-basis mode to make more nearly automatically than the time amount shaft-basis hysteresis object 32 of "time:2" a latter time amount shaft-basis hysteresis object into an invalid. In addition, having not carried out processing for which the effective hysteresis pointer which the time amount shaft-basis hysteresis management object 30 manages is moved at the time of the Undo functional activation in operator criteria mode In the time of activation of the Undo function by operator criteria mode, a time amount shaft-basis hysteresis object does not necessarily become continuously, and with the gestalt of this operation It is because there is no semantics in performing the processing concerned since it was made to make the location of the time amount shaft-basis hysteresis object made into an invalid specify at the time of a mode change not much.

[0060] First, the time amount shaft-basis hysteresis object 37 in the end of the time amount shaft-basis hysteresis object train begun from the time amount shaft-basis hysteresis management object 30 is acquired (step 121). Since the time amount shaft-basis hysteresis object 37 concerned is the latter part and is already made into the invalid from the specified time amount shaft-basis hysteresis object 32, it processes nothing. And the time amount shaft-basis hysteresis object 36 which is just before that is acquired (step 122,123,128). Since this time amount shaft-basis hysteresis object 36 and also the time

amount shaft-basis hysteresis objects 35 and 34 are also made into the invalid, nothing is processed similarly. Then, the time amount shaft-basis hysteresis object 33 is acquired (step 121). Since the time amount shaft-basis hysteresis object 33 concerned is the latter part and its effective flag is more "effective" than the specified time amount shaft-basis hysteresis object 32, the effective flag of this time amount shaft-basis hysteresis object 33 is changed "invalid" (step 124). And the effective flag of the model criteria hysteresis object 43 related with the time amount shaft-basis hysteresis object 33 is changed "invalid" (step 125). And about this processing, although a part DB21 is changed through the part DB Management Department 22 using the status information in front of the actuation activation to the element for Undo which relates with the model criteria hysteresis object 43, and is held in hysteresis DB23 (step 126), since it is the same as that of step 115 of drawing 20 , detailed explanation is omitted. Then, the hysteresis DB Management Department 24 changes the effective flag of the operator criteria hysteresis object 53 "invalid" (step 127). Next, since the time amount shaft-basis hysteresis object 32 which is just before the time amount shaft-basis hysteresis object 33 is a specified hysteresis object, it ends processing here (step 128,122). This condition is shown in drawing 21 .

[0061] According to the gestalt of this operation, it can carry out regulating automatically so that an invalid time amount shaft-basis hysteresis object may become continuously as mentioned above at the time of a change in time amount shaft-basis mode. What is necessary is just to perform processing shown in the above-mentioned steps 124-126 in this case that what is necessary is just to cancel one by one from the hysteresis object to which it was pointed out by the effective hysteresis pointer 77 which a time amount shaft-basis hysteresis management object manages, when a Undo function is performed next. In addition, since it does not use at the time of activation of the Undo function in time-axis criteria mode, it is not necessary to not necessarily move the effective hysteresis pointer which the model criteria hysteresis management object 40 and the operator criteria hysteresis management object 50 manage according to modification of an effective flag. At the time of a change in operator criteria mode, it can reset automatically by referring to the effective flag of each hysteresis object.

[0062] By the way, in the gestalt of this operation, when change processing to time-axis criteria mode is performed in the middle of a design, there is a possibility that it may be compulsorily canceled to actuation not to cancel or actuation by other architects. For this reason, caution is required to a mode change. However, if this outputs the message actuation for automatic cancellation, and for a check to each terminal unit 10 or actuation for automatic cancellation is based on other architects when mode change directions are carried out from one of architects, it is [this] possible in coping with it by preparing an adjustment function at the time of the mode change which performs various adjustments, such as controlling a mode change.

[0063] Processing when a Redo function is performed in activation (time-axis criteria mode) of a Redo function, next time-axis criteria mode is explained.

[0064] The Undo function which set it in the team not related according to an architect as usual, and was performed immediately before is made revitalized in the Redo function in time amount shaft-basis mode. That is, although it will be shown in drawing 23 if a Redo function is performed in the condition of drawing 21 , the actuation at this time is explained using the flow chart shown in drawing 24 .

[0065] Suppose that one of architects performed the Redo function. According to drawing 21 , it is equivalent to revival directions of the "correction of element 1" actuation by Architect A. This actuation is understood by the Redo functional activation section 15, and is transmitted to a database server 20 through a network 1. An architect name (=A) and an actuation name (=Redo) are included in the content of actuation transmitted. Although the hysteresis DB Management Department 24 is first made into the invalid with activation of a Redo function among the time amount shaft-basis hysteresis objects connected with the time amount shaft-basis hysteresis management object 30, it acquires the time amount shaft-basis hysteresis object 33 located in a head (step 131). In addition, this time amount shaft-basis hysteresis object 33 can be easily obtained also from the location of the effective hysteresis pointer shown by the arrow head 77. And the effective flag of the time amount shaft-basis hysteresis management object 30 is changed effectively (step 132). Then, it is made to move so that the time amount shaft-basis hysteresis object 33 which confirmed the effective hysteresis pointer may be pointed

out (step 133). And the effective flag of the model criteria hysteresis object 43 related with the time amount shaft-basis hysteresis object 33 is changed effectively (step 134).
[0066] the status information which relates with a model criteria hysteresis object and is held in hysteresis DB23 here -- using -- the part DB Management Department 22 -- leading -- a part DB21 -- as follows -- a case -- dividing -- carrying out -- changing (step 135) .
[0067] In Redo of "creation" actuation, the configuration data object which it left is re-registered into the set of an effective existing configuration data object. In Redo of "correction" actuation, the configuration data object which is in a part DB21 using the status information immediately after the actuation activation to the backed up element for Redo is changed. In Redo of "deletion" actuation, a configuration data object will not exist. In addition, it leaves the configuration data object concerned as it is for Undo functional activation for the second time. In this example, since it corresponds in Redo of "correction" actuation, a configuration data object will be changed using the backed up status information.
[0068] Then, the hysteresis DB Management Department 24 changes effectively the effective flag of the operator criteria hysteresis object 53 (step 136). In addition, in the gestalt of this operation, the arrow head 71 of the effective hysteresis pointer which the model criteria hysteresis management object 40 manages as shown in drawing 23 is moved to the model criteria hysteresis object 43. Furthermore, a condition when a Redo function is performed is shown in drawing 25 .
[0069] According to the gestalt of this operation, it can do in this way and the same Redo function as usual can be offered.
[0070] Processing when a Redo function is performed in activation (operator criteria mode) of a Redo function, next operator criteria mode is explained. In addition, the effective hysteresis pointer which the model criteria hysteresis management object 40 and the operator criteria hysteresis management object 50 manage, respectively is always moved so that data conflict may not be caused at the time of time amount shaft-basis mode. The condition when operator criteria mode is chosen as drawing 26 in drawing 25 and the mode is changed to it is shown. Although it will be shown in drawing 27 if a Redo function is performed by Architect A in the condition of this drawing 26 , the actuation at this time is explained using the flow chart shown in drawing 28 .
[0071] In the condition which showed in drawing 26 , although actuation when Architect A performs a Redo function is equivalent to revival directions of "creation of element 2" actuation in this example based on drawing 30 , this actuation is understood by the Redo functional activation section 15, and is transmitted to a database server 20 through a network 1. An architect name (=A) and an actuation name (=Redo) are included in the content of actuation transmitted. although the hysteresis DB Management Department 24 is first made into the invalid with activation of a Redo function among the trains of the operator criteria hysteresis object which the operator criteria hysteresis management object 50 to Architect A manages, it acquires the operator criteria hysteresis object 55 located in a head (step 141). In addition, this operator criteria hysteresis object 55 can be easily obtained also from the location of the effective hysteresis pointer shown by the arrow head 72. And the effective flag of the operator criteria hysteresis object 55 is changed effectively (step 142). Then, it is made to move so that the operator criteria hysteresis object 55 which confirmed the effective hysteresis pointer may be pointed out (step 143). And while changing effectively the effective flag of the model criteria hysteresis object 45 related with the operator criteria hysteresis object 55, the effective hysteresis pointer of the model criteria hysteresis management object 40 to an element 2 is moved so that the model criteria hysteresis object 45 may be pointed out (step 144,145). Although the configuration data object about an element 2 is revived effectively here (step 146), since it is the same as step 135 of drawing 24 about this processing, explanation is omitted. Furthermore, the hysteresis DB Management Department 24 changes effectively the effective flag of the time amount shaft-basis hysteresis object 35 related with the operator criteria hysteresis object 55 through the model criteria hysteresis object 45 (step 147).
[0072] According to the gestalt of this operation, it can do in this way and the Redo function for every architect can be realized.
[0073] In addition, when performing a design in a team format, the case where the same element is

designed by two or more architects can be considered. For example, as shown in drawing 29 , suppose that the same element 1 was made applicable to actuation by the both sides of Architect A and Architect B. In the condition by which it was shown in drawing 29 , if Architect B is going to perform a Undo function and cancel "correction of element 1" actuation, the CAD system in the gestalt of this operation will discover that "deletion of element 1" actuation by Architect A must also be canceled. In such a case, the following solutions can be considered.

[0074] How to give advice that it cannot perform by existence of actuation of Architect A to Architect B in the first place, and consider as an activation error can be considered. Since the Undo function was performed by Architect B to Architect A the second, how to notify the purport whether I may cancel "deletion of element 1" actuation, and make it choosing about the propriety of cancellation of actuation can be considered. The mode in which unconditionally third inconvenient actuation is canceled is formed, and how to cancel compulsorily "deletion of element 1" actuation by Architect A can be considered. In the situation shown in drawing 29 , it can be coped with by the approach of arbitration also including the these-illustrated approach or the other approaches.

[0075] By the way, it is easily applicable also to various employment by building the hysteresis DB23 shown in the gestalt of this operation. For example, although actuation was canceled by every one activation of the Undo function by manual operation by the above-mentioned explanation, it is also possible to specify time to return and to cancel actuation to there automatically.

[0076] Moreover, although the object for a design of 1 was divided into two or more parts, the case where at least each part constituted with two or more elements was further designed in a team format was written for the example and a common configuration database (part DB21) and hysteresis DB23 were established for every part with the gestalt of this operation Also in a design in the team format in the level of the low order which carried out the fragmentation rate further, it is [in / the whole object for a design like moreover] applicable. Or if the part information which shows which part it is data belonging to is added and managed to a configuration data object and hysteresis information even if it does not divide the object for a design of 1 into two or more parts, even when forming a team for every part, a common database can be given in the whole object for a design.

[0077] Moreover, in the gestalt of this operation, although explained by of two persons' of Architects' A and B case, it cannot be overemphasized that it can carry out even if it is three or more persons.

[0078] Furthermore, although he is trying to form an object with the gestalt of this operation, it is also possible to build the CAD system which starts this invention by technique other than an object-oriented technique.

[Translation done.]

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PRIOR ART

[Description of the Prior Art] The CAD system of the so-called team format which divides the appearance of the created automobile into two or more parts (component) used as a design unit, and designs at least each part in parallel simultaneously after that like the design of the former, for example, an automobile, when designing what consists of components which the object for a design is comparatively large-sized, and attain to a large number is introduced. Since two or more architects can do the concurrency of the design like each part and can advance it in each terminal unit for data processing in the CAD system to be used in case it designs in this team format, it becomes possible to aim at increase in efficiency of a design, and compaction of a design period as a whole. Moreover, when two or more components are contained to one part, the design of one part may be assigned to two or more architects, and a team may be formed for every part. Although the content of a design must be eventually summarized since each architect performs a design using each one of terminal units in this way, the formation of a ** disk space, the prevention of nonconformity with other architects of drawing, etc. are in the architect who designs one part and who prepares the common part database beforehand for every team, and belongs to the team by making the part database access.
[0003] Moreover, although the CAD commands, such as a design, correction, deletion, and migration, can be executed and the content of actuation can be reflected in a part database by making a keyboard, a mouse, etc. operate it in a CAD system, it has the function to collect the hysteresis information for the actuation of every. For example, when actuation is performed by the procedure as the architect A belonging to the same team and Architect B do a concurrency from a separate terminal unit to the same part and showed to drawing 30 , sequential record of the content of this actuation is carried out as hysteresis information at the hysteresis database formed not related according to an architect corresponding to the part database. The example of a content of this recorded hysteresis information is shown in drawing 31 . In drawing 31 , although the tabular format shows for convenience, each hysteresis information is generated as a hysteresis object. In addition, the "element" contained in drawing is a graphic form drawn by one commands, such as a straight line, a circle, and a square, one command is fundamentally executed by one actuation, and one graphic form is drawn. One part is designed by usually putting two or more elements together.
[0004] By the way, there is a case where he wants to cancel the element which drew by one actuation. The Redo function for reviving again the element canceled by the Undo function and Undo function for canceling the last actuation is prepared for the general CAD system, and the increase in efficiency of a design is attained.

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TECHNICAL FIELD

[Field of the Invention] This invention relates to amelioration of the undoing (Undo) function which the CAD system used in order to design in a team format, especially the CAD system offer, and a redo (Redo) function.

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] In the former however, in a hysteresis database Since it is recorded on the sequence operated in the condition of having been mixed by the hysteresis information on actuation by different architect, For example, if it is the conventional Undo function when based on the hysteresis information currently recorded on the hysteresis database shown in drawing 31 , it must perform twice to cancel "creation of element 4" actuation which Architect B did in the condition that actuation as shown in drawing 30 was carried out. That is, if Architect B does not cancel "deletion of element 2" actuation which performed the Undo function and Architect A did, he cannot cancel "creation of element 4" actuation. Therefore, when Architect A does not consent to cancellation of "deletion of element 2" actuation, "creation of element 4" actuation cannot be canceled using a Undo function.
[0006] Thus, in the former, even when it seems that he wants to cancel only actuation just before self carried out out of the actuation serially recorded in the condition of the architect of the same team having performed and having been mixed, both effective actuation must be canceled by using a Undo function. Or if a Undo function is performed, even when an element can be returned to the original condition, the new design equivalent to activation of a Undo function will occur, and it is not efficient.
[0007] It is made in order that this invention may solve the above problems, and the object is in offering the CAD system for a team formal design which offers the redo function to revive the actuation canceled by the undoing function per the undoing function as for which cancellation of actuation is made to an architect unit, or architect.

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WRITTEN AMENDMENT

---------- [procedure amendment]
[Filing Date] April 9, Heisei 11
[Procedure amendment 1]
[Document to be Amended] Description
[Item(s) to be Amended] Claim
[Method of Amendment] Modification
[Proposed Amendment]
[Claim(s)]
[Claim 1] In the CAD system which offers the undoing function for canceling the last actuation based on the order of record to said hysteresis information storage means of hysteresis information while carrying out sequential record of the content of each actuation which each architect performs in the design which two or more architects do in a team format at a hysteresis information storage means common as hysteresis information,
A hysteresis information-gathering means record on said hysteresis information-storage means with the information showing the effective invalid of the actuation set up in hysteresis information including the information about the architect who performed the classification and its actuation of the hour entry to which the actuation was carried out whenever the architect operated it, the element contained in the object for a design set as the object of the actuation, and its actuation as it is effective,
An undoing functional control processing means to change into an invalid the information showing the effective invalid of the actuation corresponding to the hysteresis information on the actuation concerned currently recorded on said hysteresis information storage means while canceling the target actuation, when an undoing function is performed,
It ****,
Said undoing functional control processing means cancels actuation just before the architect concerned carried out, when an architect performs an undoing function,
Said hysteresis information gathering means is a CAD system for a team formal design characterized by classifying the hysteresis information about one actuation a time amount shaft-basis and element exception and according to an architect, and managing it.
[Procedure amendment 2]
[Document to be Amended] Description
[Item(s) to be Amended] 0008
[Method of Amendment] Modification
[Proposed Amendment]
[0008]
[Means for Solving the Problem] In order to attain the above objects, the CAD system for a team formal design concerning this invention While carrying out sequential record of the content of each actuation which each architect performs in the design which two or more architects do in a team format at a

hysteresis information storage means common as hysteresis information In the CAD system which offers the undoing function for canceling the last actuation based on the order of record to said hysteresis information storage means of hysteresis information The hour entry to which the actuation was carried out whenever the architect operated it, the element contained in the object for a design set as the object of the actuation, A hysteresis information gathering means to record on said hysteresis information storage means with the information showing the effective invalid of the actuation set up in hysteresis information including the information about the architect who performed the classification and its actuation of the actuation as it is effective, It has an undoing functional control processing means to change into an invalid the information showing the effective invalid of the actuation corresponding to the hysteresis information on the actuation concerned currently recorded on said hysteresis information storage means while canceling the target actuation, when an undoing function is performed. Said undoing functional control processing means cancels actuation just before the architect concerned carried out, when an architect performs an undoing function, and it is characterized by classifying said hysteresis information gathering means a time-axis criteria and element exception and according to an architect, and managing the hysteresis information about one actuation.
[Procedure amendment 3]
[Document to be Amended] Description
[Item(s) to be Amended] 0009
[Method of Amendment] Deletion
[Procedure amendment 4]
[Document to be Amended] Description
[Item(s) to be Amended] 0010
[Method of Amendment] Deletion
[Procedure amendment 5]
[Document to be Amended] Description
[Item(s) to be Amended] 0011
[Method of Amendment] Deletion
[Procedure amendment 6]
[Document to be Amended] Description
[Item(s) to be Amended] 0012
[Method of Amendment] Deletion

[Translation done.]